Vol. [illegible] No. 23 [illegible] Year

# MOTOR AGE

CHICAGO DECEMBER 6, 1906

## THE A.C.A. SHOW IN BRIEF

The seventh motor car show of the Automobile Club of America, in which the American Motor Car Manufacturers' Association and outside manufacturers are co-operating, opens Saturday night in Grand Central palace, New York, and from the very moment the doors are thrown open it is apparent the affair is a grand success. Because of the layout of the building the promoters do not attempt elaborate decorations, but still display enough artistic taste to get up a show well worthy of their reputations in the promotion line. The big building is packed to the doors with exhibitors, and the public rushes in to see all the latest ideas in motor construction.

Every indication points to a record-breaking attendance before the week is over, exhibitors fairly clamoring for trade tickets, 13,000 of them having been purchased by Tuesday. The general public takes as much interest in the affair as if it had been held a month later, the opening for A. C. A. members Saturday afternoon being attended by the "400."

The number of exhibitors in the palace compares favorably with England's latest effort in Olympia hall, America having some 230 exhibitors to England's 290. Foreign cars are well represented in the New York affair, nearly every one of the leading makes of Europe occupying space.

In all 186 gasoline cars are on display in Grand Central palace, 139 of them being of American manufacture. Forty-eight chassis, thirty-three of them American, are displayed. Nine commercial gasoline rigs are shown along with three chassis. Water-cooled motors number 215 as against nineteen air-coolers. Two hundred and twenty-seven four-cycle motors, two two-cycle and five compound motors are shown. One hundred and eighty four-cylinder vertical and four four-cylinder V motors are exhibited. In the steam car line ten cars are found, eight of them shaft and two chain drive. Four electrics are on display.

Fifty-eight cars use make-and-break ignition, 176 jump spark ignition, forty-five jump spark magneto, 138 jump spark batteries, eleven jump spark double and five mixed ignition. One hundred and fourteen cars employ sliding gear transmission, eighty-five selective gear, twenty-five planetary and ten friction. One hundred and forty-six use shaft drive and seventy-one side chain drive.

General satisfaction is expressed by the exhibitors at the date selected for the show, many declaring that even as early as November would not be amiss. The tendencies brought out by the show prove that high-powered runabouts are decidedly popular and that enclosed cars are in demand. Motors are larger, workmanship is better, bodies are more elegant—there is great improvement.

Taking advantage of this fine chance to get together, many motorists are meeting in New York. Sunday night the New York Motor Club gave an elaborate smoker, which stands out as the red letter event of the week so far. The American Automobile Association directors got together long enough Tuesday to decide on a set of officers. The nominating committee decided to put Judge Hotchkiss, of Buffalo, up for president in place of John Farson, while Fred Elliott, of Syracuse, N. Y., is considered a worthy successor to Sidney S. Gorham. Other organizations will get together during the show—the mechanical branch of the A. L. A. M., the American Motor League, the Pennsylvania Motor League, while the week will wind up with the banquet of the Automobile Club of America next Saturday night. This will occur after the show closes.

# FIRST OF THE SEASON'S SHOWS

NEW YORK, Dec. 2—A most creditable and satisfactory show, a surprisingly complete show for an opening night; in fact, a truly splendid show. This is the meed of recognition and praise well earned by the Automobile Club of America and its co-operators, the American Motor Car Manufacturers' Association and the Motor and Accessories' Manufacturers, for its show which opened at the Grand Central palace last night and which will continue throughout this week. It is a verdict not confined to those reckless in their praise and carried away by the crowded aisles and booths of a paper first night, the glare of electric lights, the flash of polished metal, the sheen of varnish, and the hurrah that invariably goes with everything nowadays that is at all big in motoring.

Calm critics, who have been at all the shows west and east since this exhibition promoting began, and men whose business it is to study the cars and their makeup and care naught for surroundings save those that contribute to convenience of inspection, join in the popular commendation that this show has already won. Only so far as the participation of the American Motor Car Manufacturers' Association has gone is the show an organized, disciplined exposition. Beyond this it is a free-for-all, first come, first served, exhibition of American motor car manufacturing free lances. For all that, it is comprehensive and representative in fashion, makes and variety. Above all it does the highest credit to the dignity the American industry now has attained; for in the whole outfit there are not to be found more than three exhibits worthy to be classed as at all freakish. In a word, the show is an exposition of high grade American attainments to date and of the results of carrying out for the most part conventional and recognized forms of construction. It is a splendid showing of well-built machinery and up-to-date equipment that marks just as big an advance for 1907 over 1906 as 1906 showed over 1905. This statement, mind you, is not mere individual opinion, but the concensus of the criticism of calm, conservative critics, who know whereof they speak. If at the coming January show some of the older and larger makers can, to use poker terms, see the independent makers and raise them and have up their sleeve still further advancements toward the perfect and the ideal, then this rivalry between two opposing contingents of makers and showmen will be a blessing in that it must bring the supremacy of the American industry among the nations, not mere steps, but great strides nearer attainment.

The success of the show as an exhibition and as an exposition of 1907 models, combined with the promise of big attendance with the logical accompaniment of satisfactory agency placing and individual sales, would seem to be confirmation and endorsement of Motor Age's advocacy of early shows. That so fine and comprehensive an aggregation of next year's models should have been gotten ready fully 6 weeks in advance of previous years

SATURDAY'S CONGESTION OF TRAFFIC OUTSIDE THE BUILDING

# OPENS IN GRAND CENTRAL PALACE

is a complete demonstration of the possibility of having ready for the public by autumn, which has become the real beginning of the selling season, the models of the coming year. Whatever may be the financial and selling outcome of this show the makers participating will have occasion long before the swallows nest again to rise up and call blessed those who have forced them to this early bestirring of themselves. The dealers will have occasion to rejoice and are not likely, when the spring rush comes, to have their hands and feet tied by insufficient shipments and empty salesrooms. This early show advocacy and accomplishment is the best and biggest thing the independent association has done yet for its fellows within and without the organized fold of the opposition.

A remarkable feature of the show is its first night readiness and completeness. Out of some ninety catalogued complete car exhibits there were but seven absentees. They were the Moon, Dolson, Torbensen, Riveria, Pilain, Shawmut and Roessell. The last named, by the way, has withdrawn altogether and disposed of its space. The belated cars of the others are expected to be at their stands on Monday. On Thursday there was not a car in the building. Friday morning, however, they began to line up on Forty-third street and from that time to 4 o'clock Saturday afternoon, when the doors were thrown open for a preliminary viewing by the members and their guests, the big elevator's going up and going down was unbroken.

Two hundred and twenty-eight cars and chassis were on exhibition tonight, according to the count of the Motor Age staff. Including the absentees already noted the complete car exhibit at the show will embrace positively thirty-seven makes by the thirty-nine members of the American Motor Car Manufacturers' Association, probably two or three more than twenty-eight brands of unattached makers, and around twenty-one foreign varieties. The exact figures will be found in the technical end of Motor Age's show story.

There has been no decorative hurrah over this show. The club has made no attempt at elaborate decorations. It realized that the Grand Central palace would not lend itself to the realization of any high art aspirations. With Madison Square garden exclusively preëmpted and a limbo placed by the state authorities on any further leasing of the city's armories for show purposes, the club was up against it for an adequate exhibition hall. Where there was a will there was a way was again proved by Secretary Butler, of the club, and General Manager Reeves, of the association, who, bethinking themselves of the Grand Central palace, leased it. The building was fully as conveniently located as Madison Square garden to the hotel and rialto district and affords fairly adequate show space. It is located on Lexington avenue and extends from Forty-third to Forty-fourth. The two floors and street gallery utilized furnish 55,000 square

FORTY-THIRD STREET ENTRANCE TO THE GRAND PALACE

GENERAL VIEW OF ONE SIDE OF THE GALLERY, FROM THE GROUND FLOOR

feet. The main floor is up steep flights of stairs and other hard climbs take one to the so-called second floor and gallery. Showgoers certainly will have thickened calves and expanded chest measure by the time Saturday night comes.

Extending from the main floor up three stories to an arched glass roof is a rotunda, some 100 by 200 feet in area. This saves the pentupativeness of the hall and gives it somewhat of an imposing appearance. Far beyond this, north, south, east and west, extend the one-storied floors. The main floor is given up entirely to pleasure cars. The A. M. C. M. A. members have 25,000 square feet on the main floor. Encircling the rotunda on the second floor are the exhibits of the M. and A. M. To the north of the second floor are the commercial trucks, which make a brave display indeed. The other three sides are given over to sundries and parts people, who also fringe the gallery of the third floor.

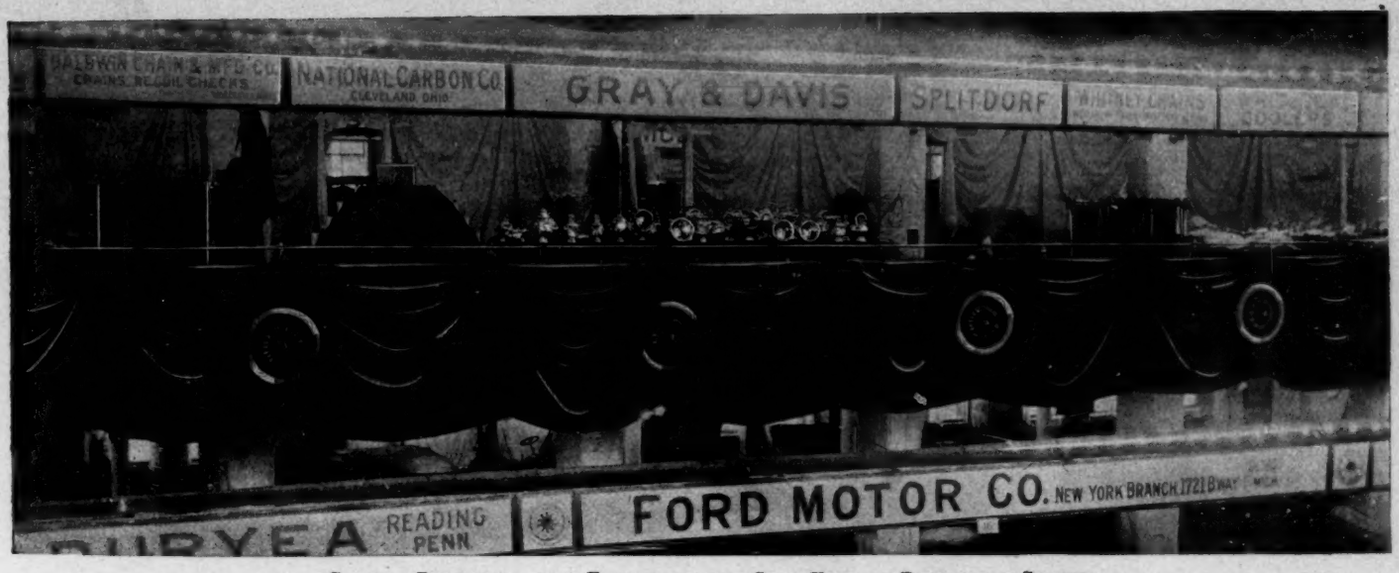
As has been said before, there has been no attempt at elaborate decoration, yet the effect of the whole is harmonious and pleasing, though, of course, it is left to the beautiful cars themselves, with their polished metal, flashing varnish and rich upholstery, to contribute the gorgeous and the spectacular, and they well do their part; for, after all, what more dazzling sight can be furnished than a vast display of modern motor cars, all under one roof?

After all the talk of the barren old barn of a Grand Central palace there was unfeigned surprise and most agreeable disappointment that Secretary Butler had evolved from such a poor background and surroundings so good-looking a show. As one entered the rotunda he found it quite an imposing exhibition hall. Seven electric chandeliers above and a monster electrically-illumined club pin, facing him on the west wall above a line of evergreen trees, afforded a brilliancy that approached the dazzling degree. Electric lights will do a lot, you know. Above the glass roof had been covered with light gray cloth. The color scheme of decoration is green, white and gold with a touch of red furnished by the club pins, which are much in evidence. The galleries are hung with green pinned to the big club emblems, red wheels with the name in gold, familiar in the decorations of the early Madison Square garden shows and last January's armory exhibition. Far up from the top gallery hung the new club flags of yellow, green and gold. The signs are green lettered and bordered on a white background, the letters and border being outlined in gold. Those in the rotunda are lighted by shaded lights above. The pillars have been wrapped and the walls hung in very light, smoke-gray cloth, which is criticised as giving a dusty and house-cleaning covering effect, as though the walls were only temporarily covered and were later to be shown. Probably the walls were actually in a bad way and, after all, the light gray gives a softer effect than probably would have been attained by out and out white hangings such as are so often used.

The cars are shown on slightly raised platforms covered with brown cloth. Duncan Currie, the matter-of-fact press agent of the show, says rather vaguely that an out-of-door effect has been sought—probably gray for clouds, green for foliage and brown for mother earth. Anyhow, there is not too much to attract the eye of the visitor and the pen of the reporter from the handsome cars themselves.

The A. M. C. M. A. members had the pick of the space to start with and settled its distribution by lot. The lucky five to draw rotunda space were Jeffery and Panhard-Levassor to the south of the main aisle and Ford, Duryea and Aerocar to the north. The others were off in the labyrinth of the floor. An attempt had been made to indicate their location in the maze by the erection of bulletin signs bearing their names and steering the promenaders and searchers around the corners. Away off in the wilderness of upper floors, reached by an elevator, were the exhibition hall of the Aero Club of America, where the high-flyers and hot gas motorists held forth; and a theater, where there was a continuous moving picture show of great motor car and ballooning events. Crowds jammed the entrances to the eleva-

ROW OF IMPOSING-LOOKING FOREIGN CARS




GALLERY DRAPERIES, WITH EMBLEM OF THE CLUB USED IN DECORATION SCHEME

tors all the time and there was a big attendance at both functions which were at the top of the building.

The Aero Club exhibit is most complete. Everything that has to do with aerial navigation seems to be on view. Included in the display are Lieutenant Lahm's balloon, the United States. The Aero Club shows Centaur and Orient, with which successful ascents were made from Pittsfield a short time ago, and the Santos Dumont airship No. 9. Of interest are Roy Knabenshue's new aeroplane and motor, which weighs only a trifle over 3 pounds for each horsepower developed, and which is now shown in public for the first time, and the Langley engine, which develops an even larger power for its weight. The Langley engine is being exploited by the Smithsonian Institute, of Washington. Leo Stevens exhibits the California Arrow and two other airships besides. Other exhibits are Henry Rodemeyer's flapping wing machine, with which an attempt is made to imitate the flight of a bird, and G. Curtis Gillespie's two full-sized flying machines. Interesting models of airships and aeroplanes are shown by Carl Hartman, of Windfield Junction, N. Y., and Miss E. L. Todd, of this city. The Curtis Mfg. Co., of Hammondsport, N. Y., has a wind wagon with a fan propeller, and Professor Pickering, of Harvard, shows a bicycle which he propels by somewhat similar means and which makes a hit with the curious. Coming from the heavens above down to the motor car show once more and summing up the results attained, it is but justice to compliment that master of detail, Secretary S. M. Butler, the manager of the show, on whom so much of the work of the show committee fell, both as originator and administrator, on the excellence of his arrangements and organization. Exhibitors, visitors and trade paper critics took occasion to award the secretary unstinted praise for his surmounting of the difficulties the building presented and his masterly organization. The latter made possible the entrance and placing of exhibits so that within 30 hours from the close of Thursday night's ball at the palace a practically complete show was in readiness despite the fact that it was held far up on the second story of a building that presented few conveniences for rapid access. And this is by no means a mere jolly of a good fellow, but rather an appreciation that is rightly due an efficient manager in these days of loosely conducted motor car factions, to which, fortunately, the management of the big shows has been an exception, thanks to our Sam Mileses and our George Days.

A C. G. V. TOWN CAR, AMONG FOREIGNERS

The club gave a preliminary view to its members and guests from 4 to 6 o'clock in the afternoon. At the hour set the show was ready. How large the club is and big its personal following was evidenced by the long line of carriages and motor cars that stretched for several blocks up Lexington avenue and by the thousands, estimated at from four to five, that accepted the invitation to the preliminary view. There was a veritable outflowing of the 400. In the evening, as usual, paper was much in evidence. The aisles were jammed and the booths were overrun. It is evident that the New York public is as enthusiastic as ever over the motor car and ready to flock to see it whenever it be exhibited, whether it be December or January. Indeed, there was much talk last night as to whether it would not be a good idea to move the show still further back into November or even October.

In the throng that packed the palace last night one saw faces of men connected with the industry at large without regard to rival association affiliations. The licensed end of the trade is largely represented in town and in the show attendance; in fact, more than one Seldenite maker has made no bones about sending designers and constructors to study what the independents have produced. All hands, however, are fraternizing and exchanging good-natured banter of the "first and best" and "wait for the big show" order. A noteworthy feature of the show is the fact that many western makers are exhibiting in the east for the first time. Among them are Holsman, the Pierce-Racine, the American, De Luxe, Dragon and Evansville. An eight-cylinder pioneer is on hand in the Marmon. This lengthy road locomotive attracted a whole lot of attention. The six-

cylinder contingent is growing. Included in it are the Panhard, Napier, Rolls-Royce, National, Compound and Ford. The big sixes are hardly as yet as much in evidence as they were at the London show. The one three-cylinder car is shown by the American trade father, Charles E. Duryea. It is a noteworthy fact that the newcomers in the industry have, with hardly an exception, adhered to strictly conventional and accepted lines of construction. In this connection the large number of new makers who have, in a comparatively short space of time, managed to put forth creditable and salable cars and gain a quick foothold in the trade is a matter of comment. It speaks well for the hustle of the newcomers and even more for the comprehensiveness and excellence of the product of the part-making branch of the industry. The quick rise of the Stoddard-Dayton, the getting out of a car in 9 weeks by the Dragon folks, and the production of a car ranking in the high-priced division by the De Luxe people are illustrations.

There are more limousines in evidence than ever in response to the big and growing demand for town cars. The type feature of the show, however, that most impresses me is the addition of the four-cylinder runabout in almost every line. It speaks well also for the pride of the makers in their product that they, more than ever before, are exhibiting chassis. In fact, a touring car, a runabout and a chassis are the almost universal exhibition layout.

The convertible tonneau and runabout construction is little attempted, though many of the four-cylinder runabouts have rumbles, which fold into rear extension. The cars being for the most part of the vertical four-cylinder type, are showy and impressive in front. The opposed cylinder construction is lending itself less ready to catchy front elevations and is in a very small minority. The massive new White steamers, with their condensers reaching as high as a man's shoulders, drew an actual mob of inspectors and investigators. The actual first car of the Dragon output, which appears in runabout form with burnished brass body, polished copper hood and red running gear and upholstery, made a decided hit from a spectacular standpoint. Its inaugural boom was helped along by a christening ceremony at 10 o'clock, whereat Miss Louise Dresser, a well-known musical comedy premiere, broke a bottle of champagne over its hood and stirred up no little hurrah. The baby Reo, which has been made over to conform to the 1907 pattern of touring car, attracts the same attention it has at all shows.

SATURDAY CROWD BEFORE THE DOORS WERE OPENED

Leaving construction comment to Motor Age's technical staff and touching only the high spots of general observation, it is to be remarked that full elliptical springs are almost universal on medium-priced cars. Selective gears are very general offerings and I-beam front axles are growing in use. The Glidden tour had its lessons and demonstrating orators are calling particular attention to increased brake equipment, both sets now for the most part being on the rear axle.

Ball bearings are coming to the front. Flaring fenders give a racy appearance to four-cylinder runabouts. The bodies are all roomy and are built on the straight line principle. Pleasure cars have for the most part longer wheelbases and 36-inch wheels are on the increase.

Many exhibitors visited the show today to add final touches to their exhibits. To them were added quite a number of tradesmen and salesmen who could not possess their souls in patience until tomorrow, when the real business of the show will begin. The weather is clear, quite cold. On the strength of the creditable display and the big crowd of last night everyone today is optimistic.

ALONG ONE OF THE OUTSIDE AISLES

# DECLARE FOR EARLY SHOWS

New York, Dec. 4—Special telegram—Exhibitors at the Grand Central palace show are pleased with the December show and consider it vastly superior to a January or February exhibit chiefly because it brings the agent to a point of action in the earlier part of December instead of after the middle of January. The agent will in many cases not close up and put in his entire season's order until the show, whether that show takes place in December or February. He procrastinates until the doors of the show open and he decides before those doors shut on the closing night. On the agent's decision depends, to a large extent, the output of the manufacturer for the approaching season as it is only after he has a tangible estimate of the prospective sales that he can accurately frame his manufacturing campaign for the coming year. After the show he knows approximately how many cars he will build and how many will be sold and then and only then can he lay his plans for reasonable delivery.

The early show is invaluable to the maker also in that he knows early how his machine has been received by the public and if he is pursuing the popular trend of design.

"Early shows are a grand affair," says H. Knepper, of the Frayer-Miller concern, "and it would be better if we had them a couple of weeks earlier than the present one. Before Christmas myriads of out-of-town people are in the city and see the cars; in January these people are all at their home. An earlier show makes business so much earlier. If a maker exhibits in January in nine cases out of ten he will not be ready much ahead of time, and if the show comes early in December, he will be ready."

Henry Ford considers that the early show allows of better plans for early spring delivery being made, that the maker can with greater accuracy forecast the season and that even a November show would be preferable.

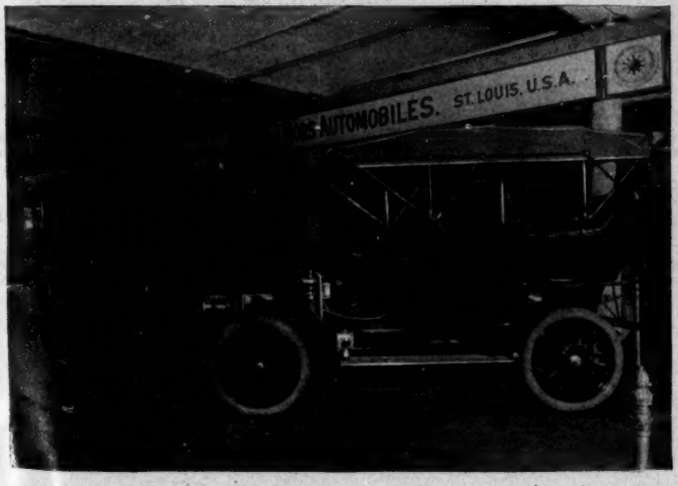
Messrs. Rainier, Tyler and Eads, of the Rainier, National and Premier, respectively, consider the show valuable in that it conduces to earlier deliveries and allows the manufacturer using the months of January and February for active manufacture instead of having them destroyed by a show circuit. Thus from first to last is the tidal wave toward early December or possibly November shows.

From the business point of view the reported sales of the opening days are equal to those of the former January shows and the placing of agencies is accomplished with equal facility. In short, the early proposition boils down to the question of why put off until tomorrow what can be done today. While many of the makers were not aware until the summer was well advanced that they were going to exhibit in December they found little difficulty in getting their new models ready and it is a fact worthy of mention that at no previous New York show have the exhibits been so well in place on the opening night.

There were the customary few who never get into place until Sunday or Monday, but they had their tales of delayed express, slow freight and the usual railroad delays. In spite of the early show the cars are in as completed a condition as in former years. The attendance is up to the standard for opening days—many think a little above the average—and the interest displayed in the cars is greater than that of former years.

# SHOW ATTENDANCE LARGE

New York, Dec. 4—Special telegram—The Grand Central palace show has made a hit. The December innovation is a winner, and from every standpoint the exhibition of the Automobile Club of America and the American Motor Car Manufacturers Association is a success—artistically, financially and from a trade standpoint, it is fully up to the expectations of the most sanguine.



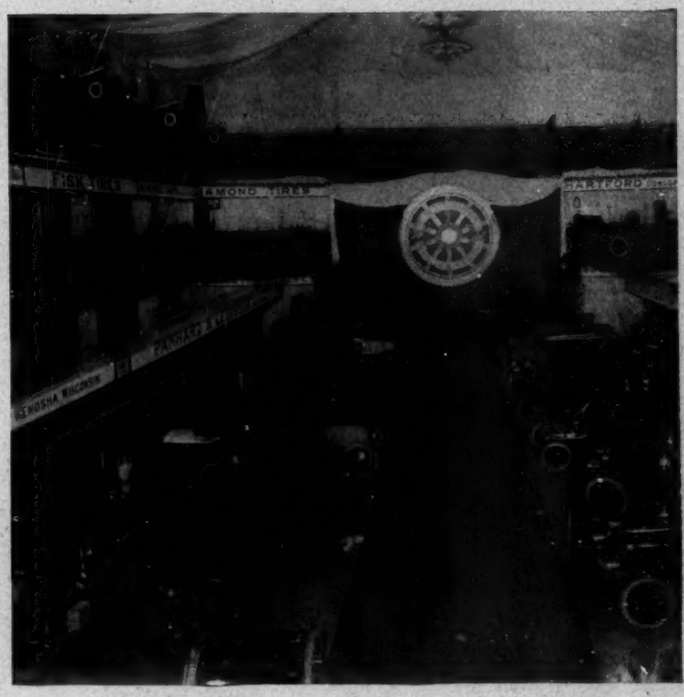

One of the Long Aisles in American Section

The attendance of dealers and tradesmen generally is very large. On every hand familiar faces in the trade are seen and they embrace sales agents, factory officials, designers and constructors of licensed concerns as well. Stories of agencies placed, outputs disposed of and individual purchases greet one on every hand. Optimism reigns supreme. Newcomers rejoice in having gained a favorable introduction and foothold.

This is the atmosphere of the show where scientific inquiries are made; the answers go to confirm the rosy situation. Even Solden sales managers are quoted by names as favoring early shows in the future on the strength of the success and patronage both of the trade and the public of the present exhibition.

The attendance has been big following the enormous paper house of the first night. Even despite sloppy, snowy, disagreeable weather yesterday morning and afternoon the attendance was big. The night was clear and cold and the crowd was again great. Though spread through many aisles and over vast aggregate area, there were no empty spots on the floors and in the galleries.

Secretary Butler says the paid admissions have exceeded at each session those of last year. It is said that already the purchase of trade tickets by makers and dealers has reached 13,000. The participants, it will then be seen, are helping the attendance boom a whole lot. That there is a big crowd of show visitors in town, there can be no doubt. The Belmont, Manhattan, Murray Hill and other nearby hotels are all crowded. The Great Belmont has all its 1,000 rooms occupied, a condition which did not even exist during horse show week. The attendance points to a howling financial success. Unless the exhibitors be the biggest bluffers and prevaricators yet evolved by this industry the business results exceed expectations and are more than satisfactory.

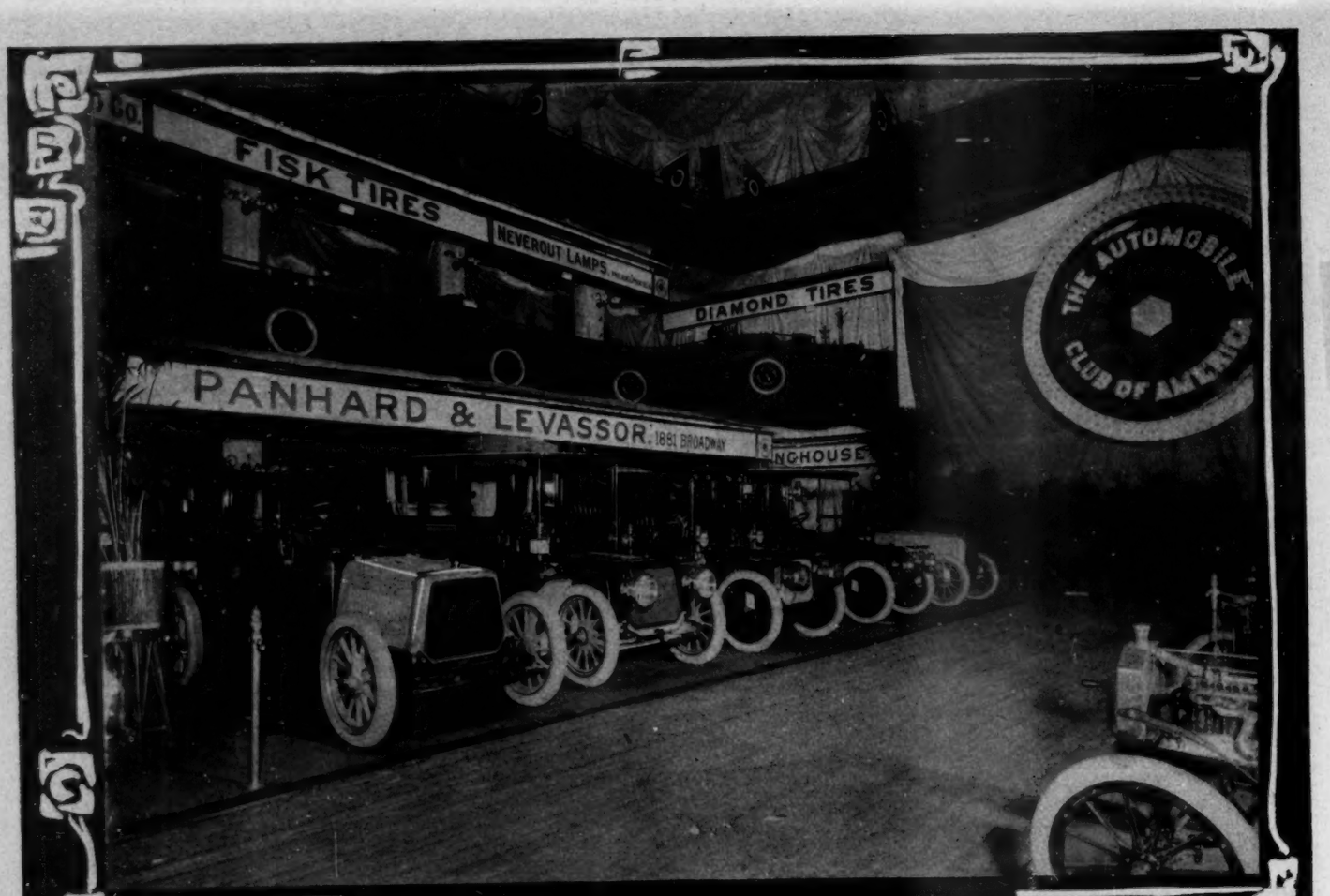


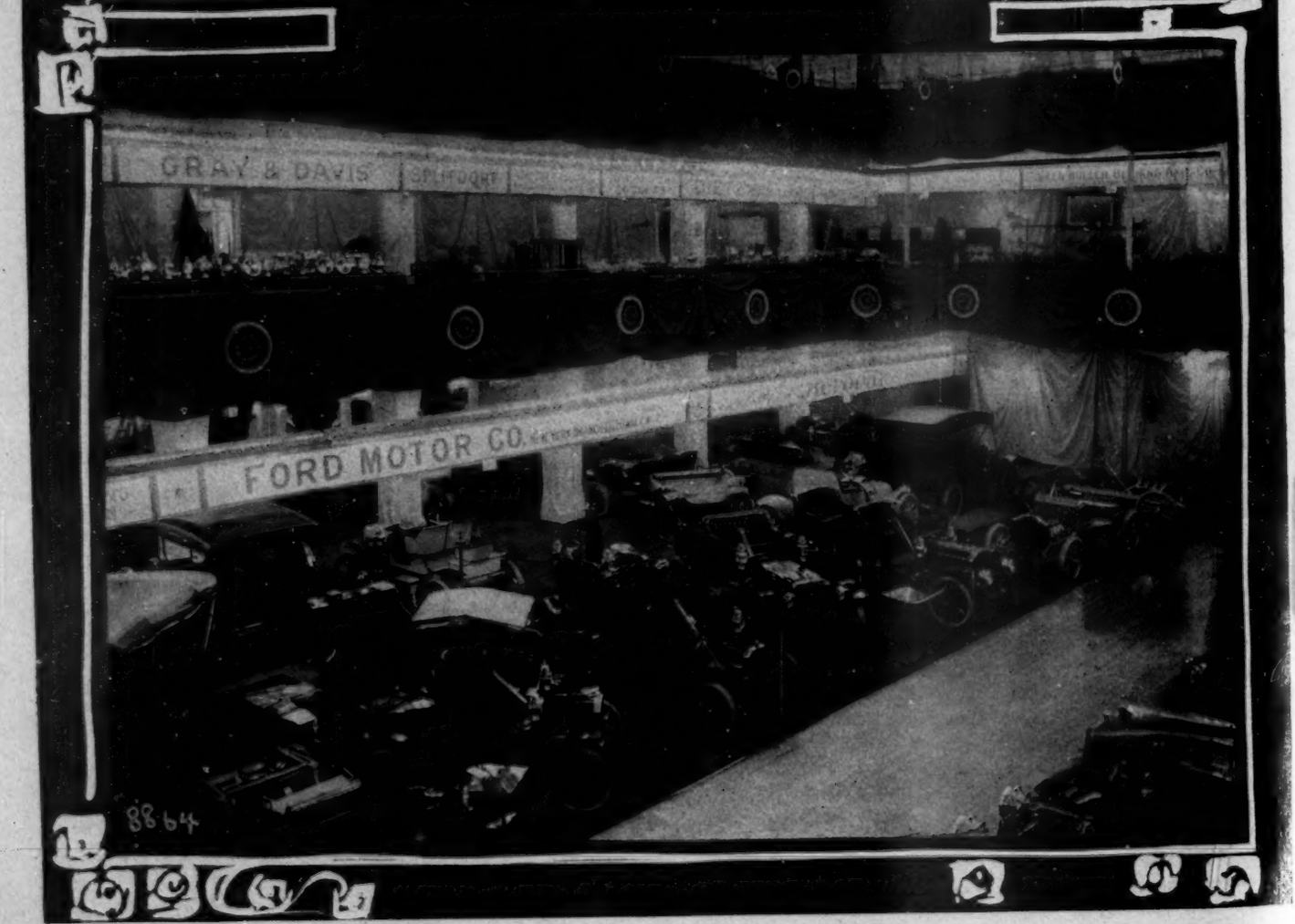
Looking Down Center Aisle, Ground Floor

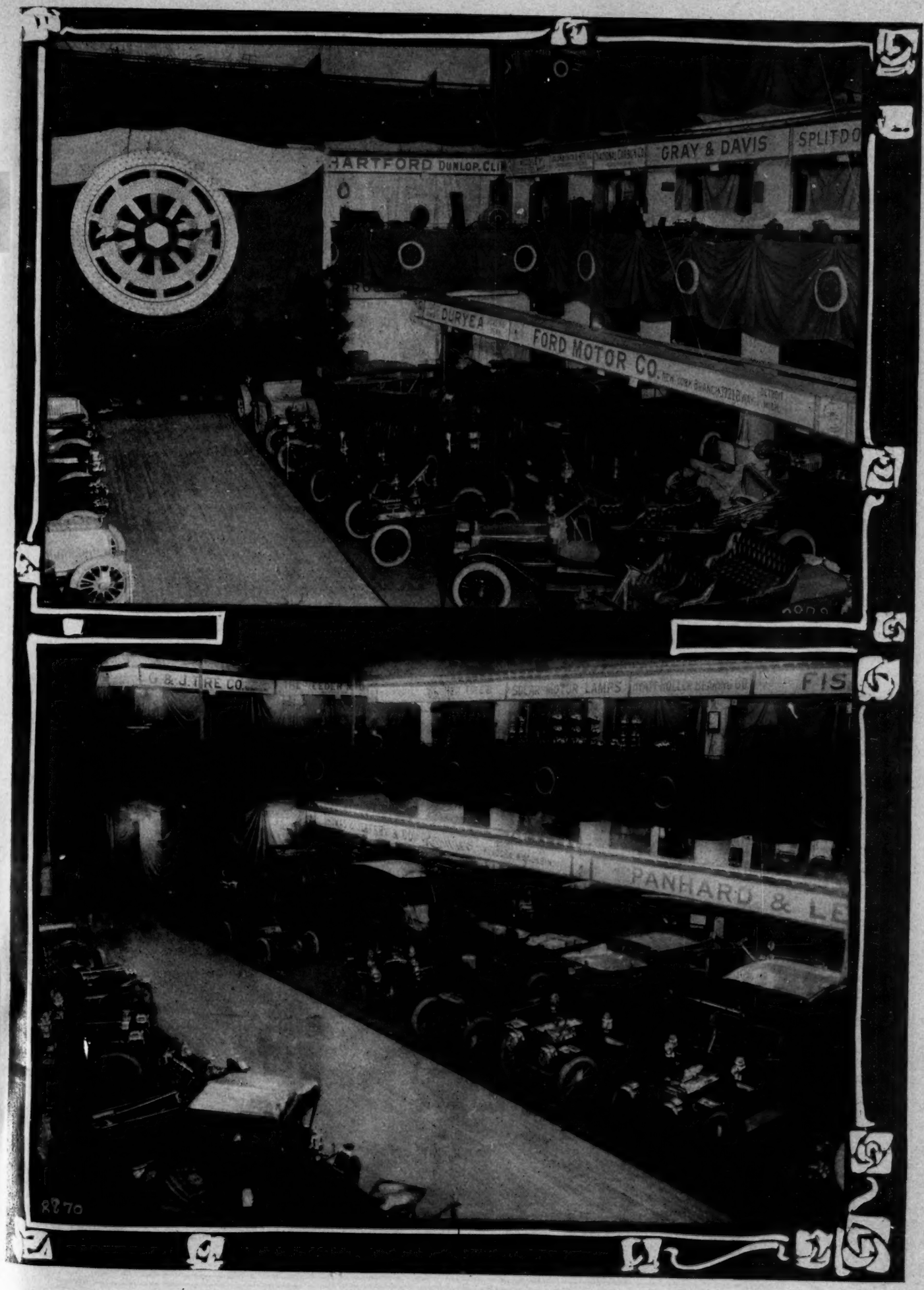
The attendance of the agents has been surprising. Dealers from all sections of the country are on hand, as is amply proved by the wholesale manner in which the exhibitors are buying tickets to give away to prospectives. The agents do not come to rubber, either, and one cannot make a trip through the big building without hearing of all kinds of deals that have taken place. The trade end of the show is not the only feature of the affair, however, for among the spectators each night are many eager to spend their money on motor cars, so the show is bound to result in good in a retail way, although, of course, the metropolitan dealers are bound to reap the greatest benefit.

Western trains continue to bring in show pilgrims, many of whom have brought their wives with them for Christmas shopping. The Cleveland express had six extra sleeping cars. There are added sleepers on all incoming trains.

The Christmas shopping rush may account for a part of the crowd, but one sees at the palace the faces of fresh arrivals every hour. It is clear and cold today. A luncheon was given at 2 o'clock this afternoon at the New York Motor Club by the Haynes Automobile Co., in honor of the arrival of Dr. Gardiner S. Chapin and H. Sargent Michaels, who have been mapping out a route for a national highway from Chicago to New York, with a view to securing the official approval of it by the states and national governments. Frank Fanning presided and Mr. Michaels told of their plans and ambitions for the big highway, expressing the wish that all motorists might help the cause along.


FISK TIRES
NEVEROUT LAMPS
DIAMOND TIRES
PANHARD & LEVASSOR. 1851 BROADWAY
THE AUTOMOBILE CLUB OF AMERICA


GRAY & DAVIS
FORD MOTOR CO.
8864


HARTFORD DUNLOP CLI
GRAY & DAVIS
SPLITDO
DURYEA
FORD MOTOR CO.
G & J. TIRE CO.
SOLAR MOTOR LAMPS
FIS
PANHARD & LE

# Statistician Sees Grand Palace Show

GASOLINE CARS

| Detail | Domestic | Foreign | Commercial | Total |
|---|---|---|---|---|
| Complete cars | 139 | 38 | 9 | 186 |
| Complete chassis | 33 | 13 | 3 | 48 |
| Water-cooled motors | 156 | 50 | 9 | 215 |
| Air-cooled motors | 16 | 0 | 3 | 19 |
| Four-cycle motors | 166 | 50 | 11 | 227 |
| Two-cycle motors | 1 | 0 | 1 | 2 |
| Compound motors | 5 | 0 | 0 | 5 |
| Eight-cylinder V motors—Marmon | 1 | 0 | 0 | 1 |
| Six-cylinder vertical motors | 6 | 2 | 0 | 8 |
| Four-cylinder vertical motors | 128 | 50 | 2 | 180 |
| Four-cylinder V motors—Marmon | 4 | 0 | 0 | 4 |
| Three-cylinder vertical motors | 4 | 0 | 0 | 1 |
| Three-cylinder oblique motors | 3 | 0 | 0 | 3 |
| Two-cylinder horizontal motors—under body | 0 | 0 | 1 | 1 |
| Two-cylinder vertical motors | 1 | 0 | 1 | 2 |
| Two-cylinder opposed motors—under bonnet | 23 | 0 | 8 | 31 |
| One-cylinder vertical motors | 0 | 0 | 0 | 0 |
| One-cylinder horizontal motors | 2 | 0 | 0 | 2 |
| Make-and-break ignition | 23 | 35 | 0 | 58 |
| Jump spark ignition | 149 | 15 | 12 | 176 |
| Jump spark magneto | 30 | 15 | 0 | 45 |
| Jump spark batteries | 119 | 7 | 12 | 138 |
| Jump spark dynamo | 0 | 0 | 0 | 0 |
| Jump spark double | 4 | 7 | 0 | 11 |
| Mixed ignition | 3 | 2 | 0 | 5 |
| Sliding gear transmission | 92 | 19 | 3 | 114 |
| Selective gear transmission | 51 | 31 | 3 | 85 |
| Planetary gear transmission | 19 | 0 | 6 | 25 |
| Friction transmission | 10 | 0 | 0 | 10 |
| Side chain drive | 24 | 38 | 9 | 71 |
| Single chain drive | 16 | 0 | 1 | 17 |
| Shaft drive | 132 | 12 | 2 | 146 |
| Body—runabout | 40 | 1 | 0 | 41 |
| Body—five-passenger tourist | 47 | 9 | 0 | 56 |
| Body—seven-passenger tourist | 23 | 7 | 0 | 30 |
| Body—limousine | 16 | 15 | 0 | 31 |
| Body—landaulet | 5 | 4 | 0 | 9 |
| Body—victoria | 8 | 2 | 0 | 10 |
| Body—miscellaneous | 0 | 0 | 0 | 0 |

STEAM CARS

| | |
|---|---|
| Complete cars | 10 |
| Complete chassis | 0 |
| Commercial cars | 0 |
| Shaft drive | 8 |
| Chain drive | 2 |

* * *

ELECTRIC CARS

| | |
|---|---|
| Complete cars | 4 |
| Complete chassis | 1 |
| Commercial cars | 2 |
| Shaft drive | 5 |
| Chain drive | 2 |

# Statistics of Previous New York Shows

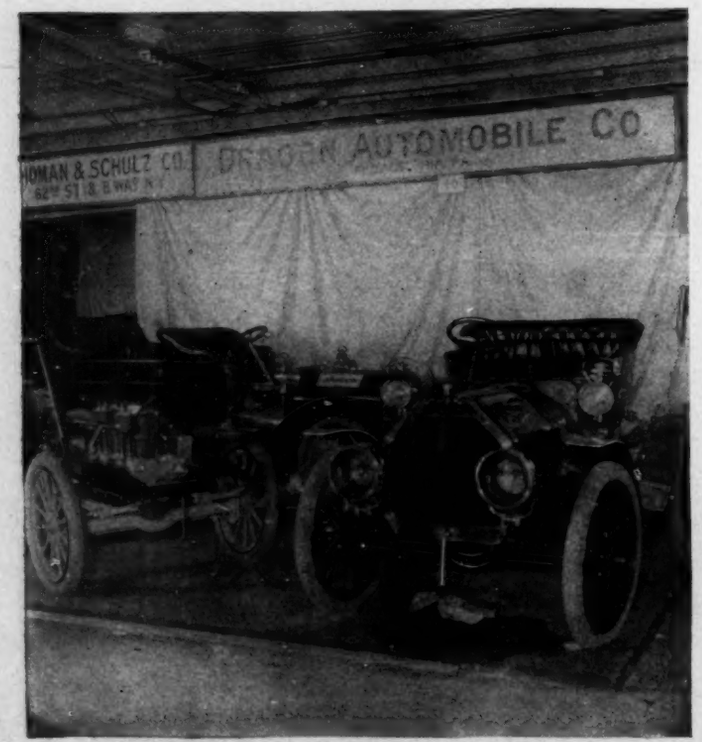
| | 1906 | | | | |
|---|---|---|---|---|---|
| | A. L. A. M. Garden | A. M. C. M. A. Armory | Both Shows | 1905 Garden | 1904 Garden |
| **TYPES OF CARS** | | | | | |
| Gasoline cars | 110 | 138 | 248 | 207 | 185 |
| Gasoline trucks | 13 | 11 | 24 | 7 | 5 |
| Gasoline chassis | 32 | 39 | 71 | *37 | *34 |
| Electric cars | 25 | 9 | 34 | 20 | 45 |
| Electric trucks | 20 | 4 | 24 | 9 | 7 |
| Steam cars | .. | 9 | 9 | 9 | 9 |
| * Not included in total count. | | | | | |
| | 200 | 210 | 410 | 289 | 285 |
| **COOLING METHODS** | | | | | |
| Water-cooled | 132 | 171 | 303 | 182 | 156 |
| Air-cooled | 23 | 17 | 40 | 25 | 29 |
| | 155 | 188 | 343 | 207 | 185 |
| **TYPES OF MOTORS** | | | | | |
| Four-cycle | 151 | 184 | 335 | 203 | 181 |
| Two-cycle | 3 | 1 | 4 | 2 | 3 |
| Compound | .. | 4 | 4 | 2 | 1 |
| | 154 | 189 | 343 | 207 | 185 |
| **CYLINDERS** | | | | | |
| Six-cylinder vertical | 2 | 3 | 5 | 2 | .. |
| Four-cylinder vertical | 137 | 119 | 256 | 127 | 82 |
| Three cylinder | 1 | 7 | 8 | 7 | 6 |
| Two-cylinder opposed | 7 | 41 | 48 | 39 | 41 |
| One-cylinder vertical | 1 | .. | 1 | 8 | 14 |
| One-cylinder horizontal | 5 | 5 | 10 | 9 | 25 |
| Other forms | 2 | 13 | 15 | 15 | 17 |
| | 155 | 188 | 343 | 207 | 185 |
| **IGNITION** | | | | | |
| Make-and-break | 33 | 42 | 75 | 19 | 21 |
| Jump spark | 113 | 141 | 254 | 188 | 158 |
| Both | 9 | 5 | 14 | .. | 6 |
| | 155 | 188 | 343 | 207 | 185 |
| **CURRENT SUPPLY** | | | | | |
| Magneto | 39 | 48 | 87 | 31 | .. |
| Batteries | 107 | 128 | 235 | 157 | .. |
| Both | 9 | 12 | 21 | 19 | .. |
| | 155 | 188 | 343 | 207 | .. |

## STATISTICS ON LONDON'S OLYMPIA SHOW

Number cars shown, 596. Number of Exhibitors, 290.
Gasoline, 575; Steam, 14; Electric, 7. Different Makes Cars, 142.
Four-cylinder, 416; Six-cylinder, 56. Average Horsepower, 27.3.

# TENDENCIES

A RAPID survey of the exhibits of the seventh annual show of the Automobile Club of America tends to confirm the impression of a year ago as to the broad tendencies of construction in such particulars as the use of anti-friction bearings, the adoption of high-grade steels for important parts subject to stress, the use of double ignition, the popularity of selective operation of the sliding gears, and a number of smaller details in construction as well. Regarding the use of special steels, such as nickel and chrome nickel steels, it may almost be said that their adoption by the more important manufacturers has forced their adoption by the smaller ones. The same, with even more force, may be said of the use of ball-bearings, which today is so nearly universal as to make the retention of plain bearings so noticeable as almost to demand explanation. This is not to say that the latter may not be very successfully used. One concern in particular may be mentioned which uses cast iron bushings of liberal dimensions and which oils the bearings by individual pipe feeds, and has had notable success and freedom from cutting with this arrangement. Other concerns use bronze bushings with different oiling arrangements, but the drift is all toward the use of annular ball-bearings made by one or two leading concerns. The bearing made by the Standard Roller Bearing Co., which was little heard of a year ago, is found in many of the leading cars at the show. Still other machines use plain or ball-bearings in the gearcase, and Timken roller-bearings in the rear axle and wheels. The result of using a properly-constructed and proportioned ball-bearing is to practically eliminate these members from the annual repair bill, so the importance of their use is much greater than the simple gain in efficiency would indicate to the motor car owner.




DRAGON CAR, WITH BRASS BODY AND COPPER RADIATOR

What is popularly known as the floating rear axle is finding an increasing number of supporters. In this type of axle the wheels run on their own bearings on extensions of the axle sleeve, and are driven through clutch plates from the live axleshafts, which are supported only at their ends in the differential and the clutch plates, and do not run in bearings. The absolute mechanical correctness of this construction is rapidly overcoming the prejudice caused, perhaps, by the apparent clumsiness of the large hubs.

Double ignition seems to be the thing for those who can afford it, except for small cars. There is, however, no present concensus of opinion as to what the two forms of ignition should be. One of them, of course, is always a battery and high-tension coil, but the other may be another battery, a low-tension magneto, or a high-tension magneto, and it may deliver current to a separate set of spark plugs, if high-tension, or to the same spark plugs that are fed by the battery. One cannot help thinking that the employment of the same spark plugs for a high-tension magneto that are familiarly used with the battery and spark coil, is open to some improvement. One maker, at least, uses a high-tension magneto and employs the secondary distributer of the magneto to distribute the current from the single induction coil used with the battery. The same spark plugs receive current from either the magneto or the battery.

In a certain sense the popularity of the shaft-driven car may be said to have increased—that is to say, many manufacturers who formerly built cars of moderate power only are now building larger cars to supplement or replace their former product, and these manufacturers generally cling to the shaft drive in spite of the increase in the dimensions and power of their cars. Nevertheless, the few concerns that have always used the side chain drive show no signs of abandoning it. Of course the question really is what use the car is to be put to, and this question cannot be answered arbitrarily from a mere consideration of the size and power of the car.

The diminishing vogue of the planetary gear lends somewhat tardy confirmation to the predictions of the mechanical wiseacres, and the fact that one well-known maker of low-priced cars has thought it worth while to enclose his planetary gear in an oil-tight stationary case attached rigidly to the crankcase of the motor, may be interpreted as confirming the same opinion. Certain it is that the class of light cars, a little larger than runabouts and a little smaller than touring cars, is not quite as universally equipped with planetary gears as it was a year ago. The tendency is distinctly toward building these cars a little larger and a little better, and equipping them with sliding gears. Apparently the purchasing public has made up its mind that the difference in construction is more than worth the difference in cost. Of course the increasing use and lower cost of high-grade special steels for the sliding gears has greatly facilitated this process of elimination, since the principal trouble with sliding gears heretofore has been their tendency to strip in unskillful hands; and with the use of tougher steels and lighter clutches, this tendency has been materially abated.

The multiple disk clutch appears to be holding its own, but it is not sweeping the field before it quite as it threatened to a year ago. These clutches demand a much greater nicety of construction than the leather-faced cone clutch, and on account of th

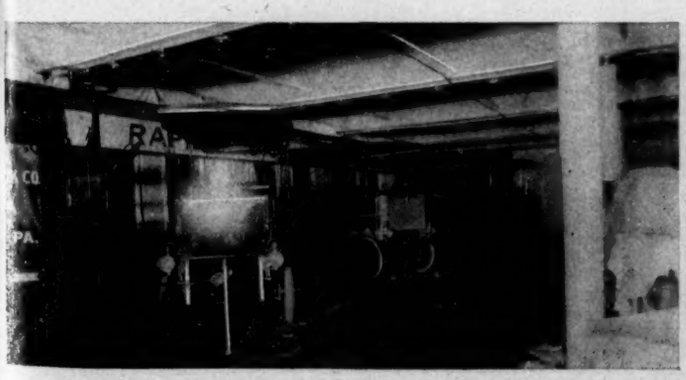
limited range of movement permissible between the free and engaging positions, it frequently happens that the disks when free are separated by nothing more than films of oil, which fill the spaces between the disks, and by their viscosity cause the disks to drag perceptibly when the clutch is released. The cone clutch, on the other hand, is entirely free when released, and this fact has led a number of builders to prefer to retain the cone clutch and mitigate the abruptness of its action by the use of cork inserts and flat springs pressing against the leather to produce gradual engagement. Whether fairly or unfairly, the impression was gained that the makers who use the multiple disk clutch did so more because they considered it a talking point than because they were convinced of its superiority.

While on the subject of transmissions, mention must be made of the three friction-drive cars seen at the show—the Lambert, the Cartercar and the Simplicity. None of them embodies ideas radically different from those proposed in connection with friction transmission heretofore, their most distinctive feature being the large size of the friction disks and wheels, which renders it unnecessary to use heavy pressure between the driving surfaces. In none of the three did the friction members look as if they could readily be protected from mud and splashed water, and there was no opportunity to test the claims of the makers regarding the efficiency of the devices under adverse weather conditions.

The separation of one or both systems of brakes from the clutch is increasingly common. Generally it is the emergency brake which is independent of the clutch, though sometimes the order is reversed and the emergency brakes release the clutch while the foot brake is independent. In one car, the Dorris, the emergency brake applies the foot brake and likewise releases the clutch. A popular arrangement of the brakes is to have a pair of external shoes operated by the foot pedal contact on the brake drums on the rear wheels, while expanding shoes inside these drums are connected by the emergency lever. In several cars seen with this arrangement, neither of the brakes released the clutch.

Almost every car examined, except in the smallest sizes, had one or another system of mechanical lubrication for the engine. There are many different forms of mechanical lubricators, but in nearly all of them the endeavor is made, in one way or another, to overcome the difficulties due, in the earlier forms of lubricators, to failure of the check valves to close or to leakage of the packing around the pump plungers. In some of these lubricators reliance is placed on a very quick pumping stroke to seat the intake check valve and minimize the relative importance of leakage past the packing. In these lubricators, of which the Dodge and the Hill Precision oilers are examples, the plunger is operated by a snap cam and spring. In these lubricators, however, check valves are not employed, but the ports are covered and uncovered mechanically by the movement of the part containing the pump barrel. In other lubricators, the valves are opened and closed mechanically by a separate device. In still others, of which the Lunkenheimer and McCord are examples, two pumps are provided for each bearing, the second a little larger than the first and the adjustment limited to the first pump, so that the second is sucking against a vacuum during a portion of its stroke. A sight glass is interposed between the pumps and the suction to the second pump insures that the glass will never become filled with oil. A feature is the number of light roadsters of between 20 and 30 horsepower for two or three persons. These cars, of which the Mora roadster, the American roadster and the Wayne are good examples, are of light construction and for the most part appear intended for light touring, for which they are very well adapted. One car, however, the B. L. M. Pirate runabout, is especially interesting as being an avowed attempt to produce a vehicle which the suburban motorist can use to advantage in place of the railway. The ordinary light runabout is too slow to answer this purpose well, and the ordinary touring car or even the runabout built on touring car lines, although it has the necessary speed, is too heavily constructed, and costs too much to purchase and to maintain, and is especially severe on tires. The Pirate runabout is claimed by its makers to weigh under 1,400 pounds and is equipped with a 24-horsepower engine. This very high ratio of power to weight is attained by the use of imported steels practically throughout the car, and by a refinement of design which suggests the racer rather than the touring car. The lines of the body in fact are the lines of a miniature racer, although it is claimed that the arrangement of the seats and the footboard is such that the passengers are fully as comfortable as they will be in seats of the ordinary type. A speed of 55 miles per hour is claimed for the car, and the rapid acceleration and high general efficiency and liveliness of the car are claimed to make it very suitable for maneuvering in traffic and for making speed on favorable roads without the necessity of pushing it at top speed under all conditions.

SIDE VIEW OF NEW DE LUXE CAR



CORNER IN THE COMMERCIAL SECTION

CHARACTERISTIC ACCESSORY EXHIBITS

# Directory of the Show-Motor Cars

**Abendroth & Root Mfg. Co., Newburgh, N. Y.—Frontenac**
One touring car, one runabout

**Acme Motor Car Co., Reading, Pa.—Acme**
One runabout, one touring car, one limousine

**Aerocar Co., Detroit, Mich.—Aerocar**
Two chassis, two touring cars, one runabout

**American Locomotive Automobile Co., New York—Berliet**
One limousine, two touring cars, one chassis

**American Motor Car Co., Indianapolis, Ind.—American**
One runabout, one touring car

**American Metal Wheel and Automobile Co., Toledo, O.—Juvenile electrics**
One juvenile electric

**American Motor Truck Co., Lockport, N. Y.—Trucks**
One truck

**Argus Import Co., New York—Argus**
One touring car, one chassis

**Austin Automobile Co., Grand Rapids, Mich.—Austin**
Two touring cars

**Bartholomew Co., Peoria, Ill.—Glide**
Two touring cars, one runabout

**Berkshire Automobile Co., Lockport, N. Y.—Berkshire**
One touring car, one chassis

**B. L. M. Motor and Equipment Co., Brooklyn, N. Y.—B. L. M.**
One racing runabout

**Bosquet & Co., New York—Bianchi**
One limousine

**Buckeye Mfg. Co., Anderson, Ind.—Lambert**
Three touring cars, one runabout, one transmission plant

**C. A. Tilleston & Co., New York—Renault**
Two touring cars

**Charron, Girardot & Voight, New York—C. G. V.**
One touring car, one limousine, one landaulet, one seven-passenger limousine, one seven-passenger touring car

**Cleveland Motor Car Co., Cleveland, O.—Cleveland**
One touring car, one chassis, one runabout, one limousine

**Commercial Truck Co. of America, Detroit, Mich.—Trucks**
One chassis, one 5-ton truck

**Conover Motor Car Co., Paterson, N. J.—Conover**
One touring car, one runabout body

**Crawford Automobile Co., Hagerstown, Md.—Crawford**
Two touring cars

**Craig-Toledo Motor Co., Toledo, O.—Craig-Toledo**
One runabout, one chassis

**Palmer & Christie, New York—Martini**
One chassis, one runabout, one touring car, one limousine

**Cryder & Co., New York—Mors**
One touring car

**Daimler Mfg. Co., Long Island City, N. Y.—American Mercedes**
One touring car, one chassis

**Dayton Motor Car Co., Dayton, O.—Stoddard-Dayton**
One chassis, one limousine, one touring car, two runabouts, one rear axle

**Delahaye and Pilain Agency, New York—Delahaye and Pilain**
One Pilain chassis, one Delahaye chassis, one Pilain limousine, one Delahaye limousine

**De Luxe Motor Car Co., Detroit, Mich.—De Luxe**
One runabout, two touring cars

**Deere-Clark Motor Car Co., Moline, Ill.—Moline**
One runabout, one touring car

**Detroit Auto Vehicle Co., Detroit, Mich.—Detroit**
One chassis, one touring car, one runabout

**Dolson Automobile Co., Charlotte, Mich.—Dolson**
One runabout, three touring cars

**Dorris Motor Car Co., St. Louis, Mo.—Dorris**
One chassis, one touring car, one runabout, one limousine

**Dragon Automobile Co., Detroit, Mich.—Dragon**
One runabout, one touring car, one chassis

**Duryea Power Co., Reading, Pa.—Duryea**
One touring car, one folding-seat runabout, one chassis

**E. B. Gallaher, New York—Brasier**
Two touring cars, one chassis, one limousine body

**E. H. V. Co., Middleton, Conn.—Compound**
Three touring cars, one runabout, one doctor's car

**Evansville Automobile Co., Evansville, Ind.—Evansville**
One touring car, one chassis

**E. W. Sutphen, New York—English Daimler**
One touring car, one limousine

**Ford Motor Car Co., Detroit, Mich.—Ford**
One runabout, one touring car, two chassis

**Grout Brothers Automobile Co., Orange, Mass.—Grout**
One touring car, one chassis

**Harrison Wagon Co., Grand Rapids, Mich.—Harrison**
Two touring cars

**Hartford Suspension Co., New York—Gobron-Brillie**
One limousine

**Holsman Automobile Co., Chicago—Holsman**
One runabout

**Itala Import Co., New York—Itala**
One chassis, one limousine, one touring car, one demi-limousine

**Panhard & Levassor, New York—Panhard**
One chassis, one six-cylinder chassis, two limousines, one touring car with Victoria top

# Directory of the Show-Motor Cars

**Jackson Automobile Co., Jackson, Mich.—Jackson**
Three touring cars, one runabout, one detachable tonneau body

**Johnson Service Co., New York—Johnson steamer**
One limousine, one touring car

**Knox Motor Truck Co., Springfield, Mass.—Atlas trucks**
One 5000-pound truck, one two-cycle truck chassis, one pleasure runabout

**Lane Motor Vehicle Co., Poughkeepsie, N. Y.—Lane steamer**
Two touring cars

**Lansden Co., Newark, N. J.—Lansden**
One electric runabout, one electrette, one electric express wagon

**Logan Construction Co., Chillicothe, O.—Logan**
One pleasure chassis, one commercial chassis, one delivery wagon, one runabout body, one motor

**Marion Motor Co., Indianapolis, Ind.—Marion**
One chassis, one runabout

**Maxwell-Briscoe Motor Co., Tarrytown, N. Y.—Maxwell**
Three runabouts, two touring cars, two chassis

**Mercedes Import Co., New York—Mercedes**
Two five-passenger limousines

**Mitchell Motor Car Co., Racine, Wis.—Mitchell**
One touring car, one runabout

**Moline Automobile Co., East Moline, Ill.—Moline**
One touring car, one runabout

**Moore Automobile Co., New York—Moore**
One touring car, one runabout, rear axle, crankshaft

**Mora Motor Car Co., Rochester, N. Y.—Mora**
One touring car, two runabouts, one power plant

**Motor Car Co., Detroit, Mich.—Cartercar**
One chassis, one touring car, one convertible surrey

**Napier Motor Co. of America, Boston, Mass.—English Napier**
One six-cylinder chassis, one runabout, one touring car

**National Motor Vehicle Co., Indianapolis, Ind.—National**
One runabout, two touring cars, one chassis

**Nordyke & Marmon Co., Indianapolis, Ind.—Marmon**
One limousine, two touring cars, one chassis, one eight-cylinder touring car

**Oscar Lear Automobile Co., Columbus, O.—Frayer-Miller**
One truck, one runabout, one chassis, one touring car, one limousine

**Palais de l'Automobile, New York—Delaunay-Belleville and Panhard**
Panhard limousine, Panhard demi-limousine, Delaunay-Belleville landaulet touring car, one Delaunay-Belleville limousine

**Pennsylvania Auto Motor Co., Philadelphia, Pa.—Buses**
One touring car, one chassis

**Pierce Engine Co., Racine, Wis.—Pierce-Racine**
One touring car, one chassis

**Premier Motor Car Co., Indianapolis, Ind.—Premier**
One chassis, one runabout, one touring car, one landaulet

**Rainier Co., New York—Rainier**
One folding front landaulet, one landaulet, one limousine, one chassis, one runabout, one touring car, one demi-limousine

**Rapid Motor Vehicle Co., Pontiac, Mich.—Rapid trucks**
One passenger van, two sight-seeing wagons, one delivery wagon, one truck

**R. Bertelli & Co., New York—Zust**
One chassis

**Renault Brothers' Selling Branch, New York—Renault**
One limousine, one touring car

**Reo Motor Car Co., Lansing, Mich.—Reo**
Two runabouts, two touring cars, one chassis, one baby Reo

**Rolls-Royce, New York—Rolls-Royce**
One six-cylinder chassis, one four-cylinder chassis

**Smith Automobile Co., Topeka, Kan.—Smith**
One touring car, one transmission, one rear axle

**Societe Anonyme Westinghouse, New York—Westinghouse**
One chassis, one limousine

**St. Louis Car Co., St. Louis, Mo.—American Mors**
One touring car, one demi-limousine

**St. Louis Motor Car Co., Peoria, Ill.—St. Louis**
One touring car, one runabout

**Thomas B. Jeffery & Co., Kenosha, Wis.—Rambler**
One chassis, one runabout, three touring cars

**Torbensen Motor Car Co., Bloomfield, N. J.—Torbensen**
One commercial truck

**Triumph Motor Car Co., Chicago—Triumph**
One runabout

**Wayne Automobile Co., Detroit, Mich.—Wayne**
One chassis, three touring cars

**Welch Motor Car Co., Detroit, Mich.—Welch**
One runabout, one detachable limousine, two touring cars

**White Co., Cleveland, O.—White steamer**
Two touring cars, one runabout, one Pullman touring car, one landaulet, one limousine, one demi-limousine

**William H. Schnader, Reading, Pa.—Riviera**
One touring car

**Woods Motor Vehicle Co., Chicago—Woods**
One touring car, one electric chassis, one stanhope, two broughams
One commercial truck

**Zim-Rock Motor Co., New York—Pungs-Finch**
One runabout, one touring car

# Directory of the Show—Accessories

**Allen Automobile Specialty Co., New York—Accessories**
Tire locks, holders, covers and license pads

**Allen & Kilduchevsky, New York—Motors**
One four-cylinder water-cooled motor with copper jackets; claimed to give 75-80 horsepower and weighing only 5 pounds to the horsepower.

**Ajax-Grieb Rubber Co., New York—Tires**
Line of moulded and wrapped tread type of Ajax tires

**American Ball-Bearing Co., Cleveland, O.—Parts**
I-beam front axles, tubular front axles, stationary rear axles and live rear axles, fitted with American ball-bearings

**American & British Mfg. Co., Bridgeport, Conn.—Parts**
Assembled pressed steel frames, steel sides and cross channels, hydraulic forged steel hubs, etc.

**American Electric Novelty Mfg. Co.—Ignition devices**
Ignition devices and automatic motor starter

**American Metal Wheel & Auto Co., Toledo, O.—Juveniles**
Juvenile real electric runabout and photographs of pedal-operated toy cars

**American Motor Co., Brockton, Mass.—Motor cycles**
M. M. single-cylinder motor cycle

**Aster Co., New York—Tires**
Clincher tires, in round and flat tread; non-skid treads to be applied, and ignition current cable

**Atwater-Kent Mfg. Co., Philadelphia, Pa.—Ignition devices**
Models of 1907 spark generators, pocket meters and battery testers

**Atwood Mfg. Co., Amesbury, Mass.—Lamps**
Various styles of acetylene head and side lamps and generators

**Aurora Automatic Machinery Co., Aurora, Ill.—Fittings**
Thor motor cycle motor and equipment; motor cycle fitted with Thor motor and power boring machine

**Autmo Cabinet Co., Rochester, N. Y.—Tool cabinets**
Autmo tool cabinets

**Autocoil Co., Jersey City, N. J.—Spark coil**
American spark coil with attached ammeter, coil units, distributor coils and motor cycle coils

**Avery Portable Light Co., Milwaukee, Wis.—Gas tanks**
Cylindrical metal tanks for storing lighting gas; brackets for attaching tanks to cars and pressure gauges

**Badger Brass Mfg. Co., Kenosha, Wis.—Lamps**
Solar acetylene head and side lights, kerosene head and side lights and gas generators

**Baker & Rigler Co., New York—Horns**
Motor and bicycle reed horns and toy horns for juvenile pedal motor cars

**Baldwin Chain & Mfg. Co., Worcester, Mass.—Chains and sprockets**
Baldwin chains, recoil checks and sprockets.

**S. F. Bowser & Co., Ft. Wayne, Ind.**
Bowser oil and gasoline tanks

**Briscoe Mfg. Co., Detroit, Mich.—Sheet metal goods**
Briscoe radiators, hoods, fenders, tanks, dust pans and dashes

**Brown-Lipe Gear Co., Syracuse, N. Y.—Gears**
Sliding gear sets in both progressive and selective types; differentials; steering wheels and steering gears

**Brownell-Trebert Co., Rochester, N. Y.—Motors**
Six-cylinder gasoline engine; four-cylinder engines

**Bryrne, Kingston & Co., Kokomo, Ind.—Carbureters**
Kingston carbureters; mufflers; cutouts; commutators; circulating pumps; spark coils; switches and plugs

**C. F. Splitdorf, New York—Coils and timers**
Jump spark coil and magneto

**Charles E. Miller, New York—Supplies**
La Bassoon horns, Miller jacks, Miller speemeter, tire brackets, etc.

**Connecticut Telephone & Electric Co., Meriden, Conn.—Electrical supplies**
Connecticut spark coils

**Continental Caoutchouc Co., New York—Tires**
Continental tires

**Consolidated Mfg. Co., Toledo, O.—Motor cycles**
Two Yale-California motor cycles with single cylinder motors

**Cramp & Sons Co., Philadelphia—Castings**
Line of Parsons manganese bronze and Parsons white brass for motor car construction

**G. H. Curtiss Mfg. Co., Hammondsport, N. Y.—Motor cycles**
Curtiss one and two-cylinder motor cycles and engines

**Dayton Electric Mfg. Co., Dayton, O.—Ignition devices**
Apple igniting and lighting apparatus and storage batteries

**Detroit Lubricator Co., Detroit, Mich.—Lubricators**
Multiple feed mechanical lubricators with various numbers of feeds

**Detroit Motor Car Supply Co., Detroit, Mich.—Tops**
Tops, bodies and wind shields

**Diamond Chain & Mfg. Co., Indianapolis, Ind.—Chains**
Diamond chrome nickel steel chains and built-up block chains

**Diamond Rubber Co., Akron, O.—Tires**
Diamond tires and Marsh rims

**R. E. Dietz Co., New York—Lamps**
A complete line of acetylene head and side lamps and kerosene side and tail lamps; also acetylene generators

**Diezemann Shock Absorber Co., Hoboken, N. J.—Shock absorbers**
Diezemann shock absorbers

**Direct Drive Axle Co., Columbus, O.—Transmissions**
Rear axle fitted with direct drive beveled gear transmission and assembly showing all its parts

**Duplex Ignition Co., New York—Spark plug**
Duplex spark plug with switch at the top, throwing into action a condenser

**Eastern Carbon Works, Jersey City, N. J.—Dry cells**
Eastern dry cells, cylindrical in shape and in various sizes

**Edmund & Jones Mfg. Co., Detroit, Mich.—Lamps**
E. & J. lamps in different models

**Ehret Tire & Tool Receptacle Co., Philadelphia, Pa.—Tool chest built in tonneau**
Car body with a receptacle in back of tonneau seat for carrying tires and parts

**Elbridge Electric Co., Elbridge, N. Y.—Ignition devices**
Electrical charging outfits and ignition apparatus; storage batteries and electric lamps

**Electric Rubber Mfg. Co., Rutherford, N. J.—Tires**
Panther wrapped tread clincher casings, M. T. triple strength inner tube and Traver blowout patches

**Electric Storage Battery Co., Philadelphia, Pa.—Batteries**
Exide batteries and sparking coils

**Firestone Tire & Rubber Co., Arkon, O.—Tires**
Firestone mechanically fastened pneumatic tires and solid tires for motor vehicle use

**Fisk Rubber Co., Chicopee Falls, Mass.—Tires**
Fisk tires of different types

**Franco-American Automobile and Supply Co., Chicago—Supplies**
Look Mfg. Co.'s storage batteries and display of plates, grids and connectors

**Gabriel Horn Mfg. Co., Cleveland, O.—Horns**
Gabriel horns and Foster shock-brakes

**Gemmer Engine Co., Wabash, Ind.—Engines**
Gemmer four-cylinder engines and two sizes of steering gears

**General Electric Co., Schenectady, N. Y.—Arc rectifiers**
Mercury arc rectifier panels for charging ignition batteries

**Gilbert Mfg. Co., New Haven, Conn.—Fabric supplies**
Gilbert tire casings, leggings, covers, steering knuckle boots, top rolls, etc.

**Goodyear Tire & Rubber Co., Arkon, O.—Tires**
Goodyear tires and rims

**Gould Storage Battery Co., Depew, N. Y.—Batteries**
Gould batteries

**B. F. Goodrich Co., Arkon, O.—Tires**
Goodrich pneumatic tires and Goodrich solid rubber side-wire tires

**Graham & Goodman, New York—Shock absorber**
Graygood double-acting hydraulic shock absorber

**Gray & Davis, Amesbury, Mass.—Lamps**
Gas head and side lamp, kerosene side and tail lamps, acetylene generators

**Gray-Hawley Mfg. Co., Detroit, Mich.—Mufflers and autochimes**
Gray muffler and autochime

**G & J Tire Co., Indianapolis—Tires**
G & J motor car and motor cycle tires and rims

**C. T. Ham Mfg. Co., Rochester, N. Y.—Lamps**
Tourist, Reliance, Aurora, Apex, Acme, Monitor and Vigilant lamps

**Harburg Tire Co., New York—Tires**
Harburg tires and detachable rims

**Hartford Automobile Parts Co., Hartford, Conn.—Parts**
New Hartford universal joint, assembled and in parts

**Hartford Rubber Works, Hartford, Conn.—Tires**
Hartford and Dunlop tires and universal rims

**Hartford Suspension Co., New York—Shock absorbers**
Models of 1907 Truffault-Hartford shock absorbers

**A. W. Harris Oil Co., Providence, R. I.—Oils**
Different grades of cylinder oils for air and water-cooled motors and oils for transmissions and differentials

# Directory of the Show—Accessories

**Hendee Mfg. Co., Springfield, Mass.—Motor cycles**
Indian motor cycle, Indian tri-car with front chair seat for extra passenger and Indian motor delivery van

**Heinze Electric Co., Lowell, Mass.—Coils**
Ammeters, voltmeters and single unit coils; also two, three and four-part coils

**Hess-Bright Mfg. Co., Philadelphia, Pa.—Bearings**
Samples of Hess-Bright ball-bearings of various sizes and for use in all parts of motor cars

**Herz & Co., New York—Electrical supplies**
Herz timers, Bougie Mercedes spark plugs, French coils, B. B. pumps, Herz distributers, and cable and wire terminals

**Hicks Speed Indicator Co., Brooklyn, N. Y.—Speed indicators**
Hicks speed indicators

**Hyatt Roller Bearing Co., Harrison, N. J.—Bearings**
Line of Hyatt roller bearings

**Igniter Appliance Co., Cleveland—Spark plugs**
Shur Fire spark plugs

**International A & V Tire Co., Milltown, N. J.—Tires**
Four models of International tires

**Jones Speedometer Co., New York—Speedometers**
Jones speedometers and auto annunciators

**Kilgore Automobile Air Cushion Co., Boston, Mass.—Shock absorbers**
Kilgore pneumatic anti-shock apparatus

**Kinsey Mfg. Co., Dayton, O.—Parts**
Motor car parts and specialties in sheet and cast metals

**Lavalette & Co., New York—Magnetos**
Eisemann-Lavalette high and low tension magnetos and induction coils

**Light Mfg. & Foundry Co., Pottstown, Pa.—Castings**
Line of aluminum, manganese bronze and bearing metal castings

**Lipman Mfg. Co., Beloit, Wis.—Odometers**
Electric speed measuring instruments and odometers

**Long & Mann Co., Rochester, N. Y.—Tires**
Minute clincher tire adjuster for putting on and taking off clincher tires

**George Loring & Co., New York—Spark plugs**
W. E. B. spark plugs

**Manhattan Screw and Stamping Co., New York—Lamps**
Line of Phoebus gas and oil lamps and generators, Apollo chime horn, Atlas tire holder, tire pumps, straining screens, etc.

**Manufacturers' Foundry Co., Waterbury, Conn.—Castings**
Cylinder castings

**Marion Motor Car Co., Indianapolis, Ind.—Transmissions**
Models of Hassler transmission

**Michelin Products Selling Co., New York—Tires**
Line of Michelin tires and tire accessories

**Midgley Mfg. Co., Columbus, O.—Pressed steel products**
Steel motor car wheels and pressed steel products.

**William P. Miller's Sons, Long Island City, N. Y.—Oils**
Pan-O-Lite gas engine cylinder oils

**Mills Mfg. Co., New York—Goggles**
Complete line of goggles in all styles

**Model Gas Engine Works, New York—Engines**
Four-cylinder engines and double opposed engines

**Morgan & Wright, Detroit—Tires**
Line of tires and universal rims

**A. R. Mosler & Co., New York—Ignition Devices**
Spitfire plugs; timers; distributors; control levers and combined coil, distributor, timer and switch.

**Motor Car Specialty Co., Trenton, N. J.—Speedometers**
Lea speed and distance measuring and registering instruments and Boss gasoline filter

**Motz Clincher Tire & Rubber Co., Akron, O.—Tires**
Solid clincher tires and Hoffecker speedometers

**Muncie Automobile Parts Co., Muncie, Ind.—Parts**
Selective three-speed transmissions

**National Carbon Co., Cleveland, O.—Ignition devices**
Columbia dry batteries, Columbia igniters, multiplex and autocell batteries and reserve dry cells

**Neumastic Tire Co., Chicago—Tire filling compound**
Samples of treated tires and in section

**N. Y. & N. J. Lubricant Co., New York—Oils**
Line of K-OO and K-OOO non-fluid oils

**Oliver Instrument Co., Minneapolis, Minn.—Speedometers**
Speedometer shown attached to wheel

**Oliver Mfg. Co., Chicago—Jacks**
Models of Peerless and E. Z. jacks

**Ovington & Lyons, New York—Motor cycles**
Wagner one-cylinder motor cycle, F. N. four-cylinder French motor cycle, and Simplex two-cylinder motor cycles

**Pennsylvania Rubber Co., Jeanette, Pa.—Tires and rims**
Pennsylvania tires and a new detachable rim

**Pittsfield Spark Coil Co., Pittsfield, Mass.—Ignition devices**
Pittsfield spark coils, Jewel mica spark plugs, combination switches, magnetos

**Post & Lester Co., Hartford, Conn.—Supplies**
Volier horns, Royal De Luxe lamps and generators, Imperial clocks, imported French ignition specialties, clothing specialties

**Prest-O-Lite Co., Indianapolis, Ind.—Gas tanks**
Gas tanks for lighting purposes and similar tanks for inflating tires

**Thomas Prosser & Sons, New York—Forgings**
Krupp steel forgings for motor cars

**J. M. Quinby & Co., Newark, N. J.—Bodies**
Several models of Quinby bodies

**Rands Mfg. Co., Detroit, Mich.—Tops**
Rands canopy, cape and extension tops

**Reading Standard Cycle Mfg. Co., Reading, Pa.—Motor cycles**
Reading Standard motor cycles in single and double diamond models

**R. H. Smith Mfg. Co., Springfield, Mass.—Motometers**
Springfield motometers and speedometers

**Rose Mfg. Co., Philadelphia—Lamps and gas producers**
Neverout motor lamps and invertible gas producers.

**J. H. Sager Co., Rochester, N. Y.—Equalizing springs**
Sager equalizing springs and Sager flexible shock eliminator

**Safety Device Co., New York—Safety valves**
Arnold tire safety valves

**Scandinavian Fur & Leather Co., New York—Motoring clothing**
Full line of clothing used by motorists

**Schwarz Wheel Co., Philadelphia—Wheels**
Artillery wheels for motor cars and heavy vehicles

**Shelby Steel Tube Co., New York—Tubing**
Seamless tubing for use in motor car construction

**Spicer Universal Joint Mfg. Co., Plainfield, N. J.—Universal Joints**
Models of universal joints

**Sprague Umbrella Co., Norwalk, O.—Tops**
Two four-bow folding tops for touring cars, each mounted on a tubular frame construction

**Standard Welding Co., Cleveland, O.—Seamless steel tubing**
Line of seamless steel tubing for motor car construction, rims, bands and side flanges

**St. John Rubber Tire Co., New York—Tires**
St. John solid rubber cushion tires

**Survey Map Co., New York—Road maps and routes**
Official A. A. A. road maps and routes

**Swinehart Clincher Tire & Rubber Co., Akron, O.—Tires**
Line of Swinehart and Pyramid tires

**Timken Roller Bearing Axle Co., Canton, O.—Bearings and axles**
Line of Timken roller bearings and axles

**Turner & Fish Co., Chicago—Steel Wheels**
Models of indestructible steel wheels, different patterns of

**Uncas Specialty Co., Norwich, Conn.—Accessories**
Motor car signal horns; timers; gasoline floats and small motor parts

**Veeder Mfg. Co., Hartford, Conn.—Odometers**
Veeder odometers and tachodometer

**Vestal Shock Absorber Co., Pittsburg, Pa.—Shock absorbers**
Vestal shock absorber attached to spring and on exhibition

**Warner Gear Co., Muncie, Ind.—Gears**
Warner spur differential gears, transmission gears and steering apparatus

**Warner Instrument Co., Beloit, Wis.—Auto-meters**
Warner auto-meters and anemometers

**Webb Mfg. Co., Newark, N. J.—Speedometers**
Webb speed-measuring instruments on exhibition and in operation

**Wheeler & Schebler, Indianapolis—Carbureters**
Models of 1907 Schebler carbureter

**Whitlock Coil Pipe Co., Hartford, Conn.—Radiators etc.**
Radiators, hoods, bent tubing for motor connections

**Whitney Mfg. Co., Hartford, Conn.—Chains**
Driving chains, keys and cutters for Woodruff system of keying, Presto chucks and friction tapping devices

**E. J. Willis Co., New York—Supplies**
Complete line of supplies, tools and wearing apparel

**Winchester Speedometer Co., New York—Speed Indicators**
Winchester speedometers

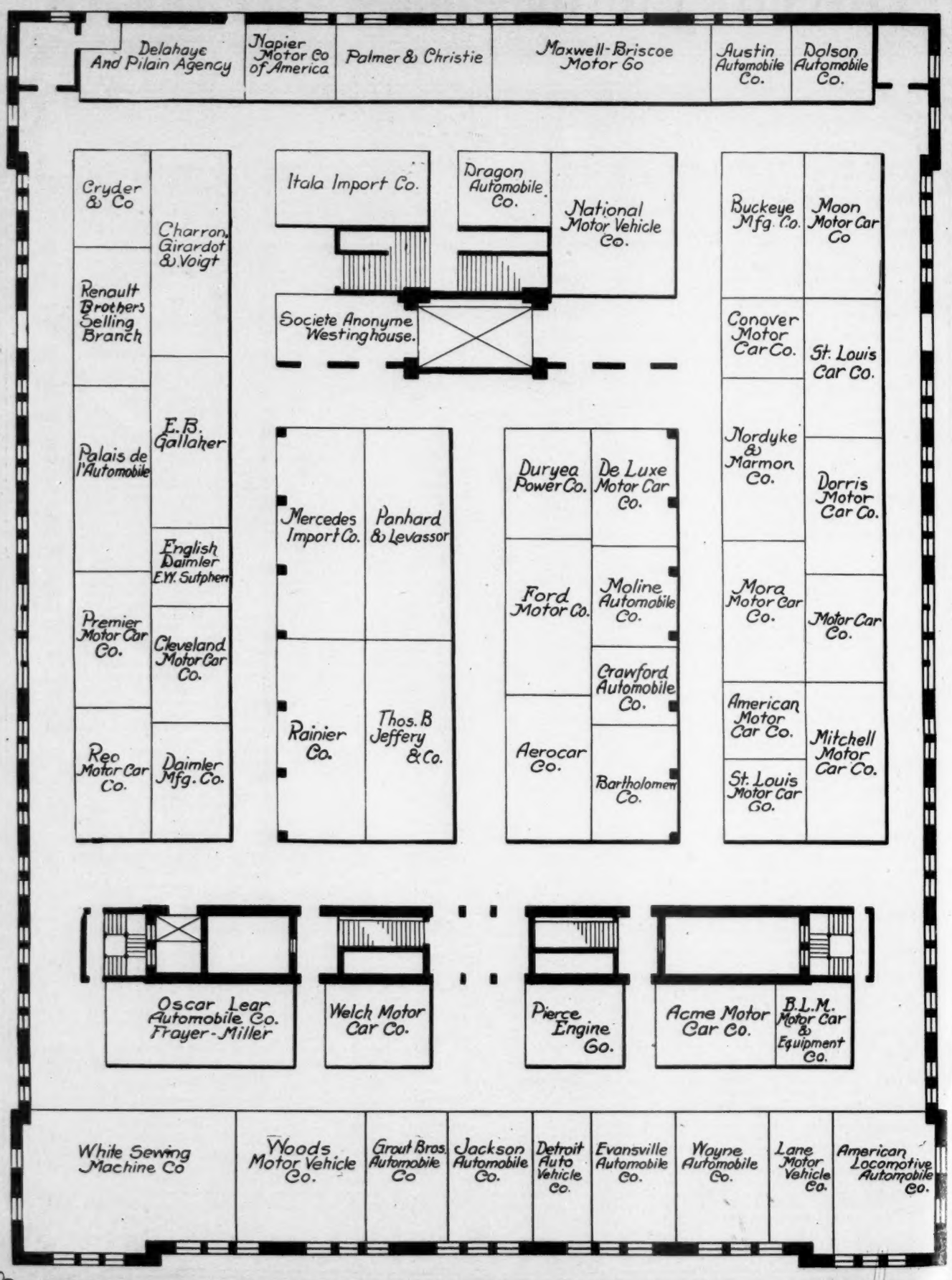
**Witherbee Igniter Co., New York—Ignition device**
Storage cells of various capacities for ignition and for lighting

**Wray Pump & Register Co., Rochester, N. Y.—Castings**
Brass, bronze and aluminum castings, Wray compound pump with gauge, Kellogg, Jr., pump

**Orlando W. Young, Newark, N. J.—Specialties**
Young's cylinder oils, cup greases, lubricants and Cox's patches

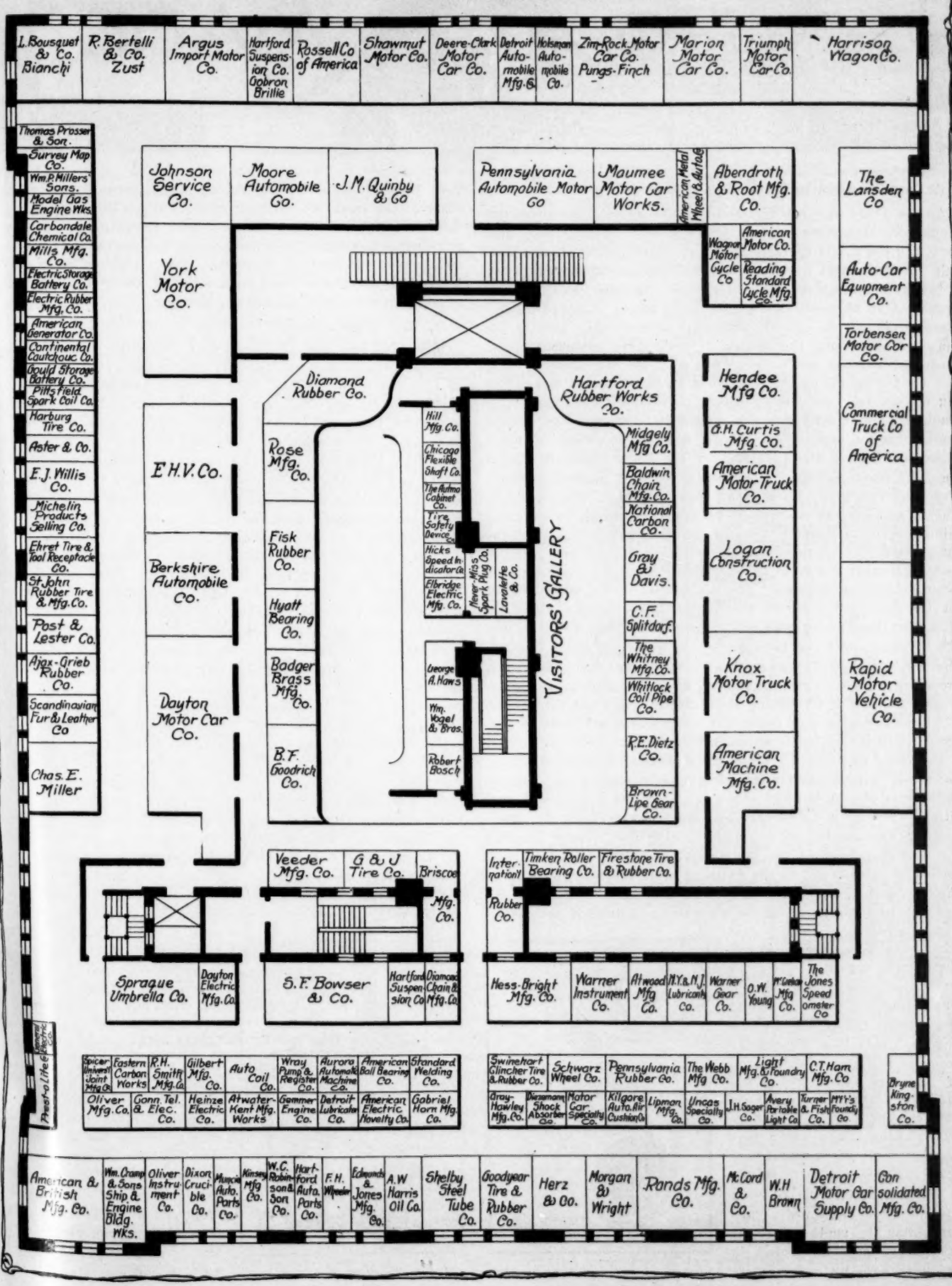
MAIN FLOOR.

# WHERE THE EXHIBITORS'



# SPACES ARE LOCATED

GALLERY FLOOR



# NOT AS OTHERS ARE MADE

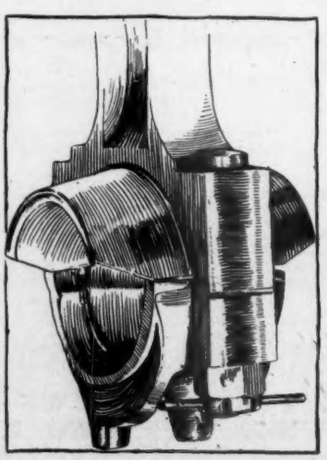
## SOME OF THE FEATURES OF CONSTRUCTION

### Unit Case Construction Destined to Be Universal

A few years ago when the Maxwell car, with its combined crankcase, clutchcase and gearbox—a unit casting—was presented to the public it created a furore of talk, criticism and ridicule. A little later when the Stevens-Duryea company exhibited a four-cylinder motor with a combined crankcase and gearbox supported on three-point suspension the storm of approval and disapproval was no less marked. Both constructions were in the cause of alignment—the getting of crankshaft, clutchshaft and shafts of gearbox perfectly in line and keeping them in that line by having all of their bearings anchored in the same casting or in a two-part casting with their adjacent ends accurately machined and rigidly bolted and locked together. The coming season has in store practically a host of followers of these pioneers. During the past summer the Mora appeared with a specially commendable and unique motor and gearbox support; and this fall such firms as Marmon, Rambler, Wayne, Glide, Logan, and several others, can be added as having in major or minor degrees taken up the unit construction. It must not be interpreted that all these makers are using a combined gearcase and crankcase; far from it. Some have done this, others have placed the transmission set and differential in the same housing on the back axle; others have encased the flywheel with its clutch in the housing with the transmission. Again others, like the Maxwell and Mora, have placed the motor and gearset on one housing. All, however, no matter where the unit casing is placed, are after the same end—the gaining of proper alignment of driving shafts, and so supporting them that they are not thrown out of alignment with each twist that the main or subframe is subjected to in the course of ordinary road traffic.

Deserving of premier attention, the Maxwell housing is a long, one-piece, three-compartment, aluminum trough, with the top open from end to end and the case crossed by a couple of partitions forming a front chamber for the crankcase, an intermediate one serving as a clutch housing and a rear chamber forming the abode of the sliding gearset. The casing is rigid from end to end, and in the finishing of it the front bearing of the crankshaft, the rear bearing of this shaft, and both end bearings of the gearset can be machined and finished accurately, and properly aligned, after which the parts are installed, the bearing caps positioned and lastly the cover parts placed. The crankcase has a second story added before the cover is put on. This is a rectangular framework fitting over the top of the case and carrying the camshaft with the pushrods. This case lifts off as a unit by itself. Lastly, the cover part for the crankcase is fitted, then that for the clutch compartment, and finally the gearbox cover. With this unit plant connection is made with the differential gearing housed in the back axle by a driveshaft with a couple of universal joints, one at the forward end and the other at the rear. These joints, like all others of their kind, are intended to act at angles. When driving the car they always are working at an angle in a vertical plane, and the result of a frame twist would compel them to act at a slight angle to the right or left, which would not impair their action or throw strain upon the aligned parts in the crankcase and gearbox.

De Luxe Cam and Shaft Bearing



Moore Connecting Rod Bearing

### Mora Case Good Example

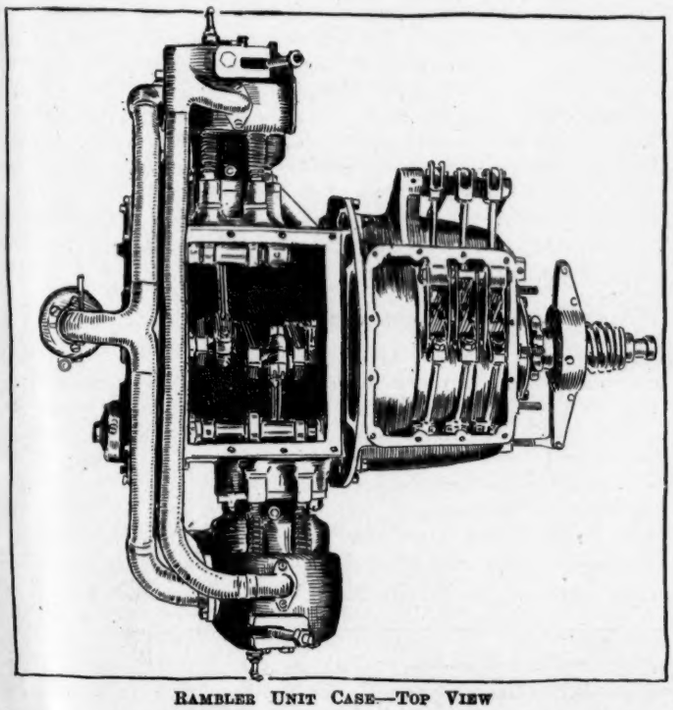
The Mora unit case is a departure, being the first one filling the entire space between the two side pieces of the car frame. It also forms the bottom half of the crankcase and gearbox. Unlike the Maxwell, it is rigid, with the frame preventing twistings of it, the frame in turn strengthening the case. Further, it is broad in the extreme, while the Maxwell tends to the cylindrical. The Mora case is in two parts, the forward one for the motor and half the flywheel and the rear parts for the gearbox and the rear half of the flywheel. The adjacent ends of these parts are accurately machined, bolted rigidly together, then the three bearings of the crankcase and the four bearings of the gearset are turned and formed accurately in line at the one time. This done, the marine type of bearings are introduced and the shafts put in place. A construction of this nature insures absolute alignment of the crankshaft, clutch and driveshaft of the gearset. Like the Maxwell alignment with the stub shaft of the back axle, it is cared for by the universal joints in the driveshaft. An attractive feature in this Mora unit case is the carrying of it on the car frame at seven points at each side, there being this number of eyeholes for bolting through into the wood and metal frame of the car. As a guard against possible breaking of that part of the case beneath the flywheel, a separate cap part is used, bolting to the rear end of the motor portion of the case and the forward end of the gearbox. Looking at this unit case from beneath a wonderful example of trussing appears in the central longitudinal web beneath the crankcase center and the double web beneath the gearbox part, all of these joined by double cross webs at the front and rear and several intermediate single cross webs. With this casing mud and dirt cannot reach the machinery and the need of a mud apron is dispensed with. Lastly, a car presenting such a smooth undersurface cannot be much of a dust raiser on the public highway.

A tendency not to be overlooked this season in unit construction is that of housing the flywheel with its clutch in the gearbox, thus providing for them a separate forward compartment. Two of the leading makers during the past fall have introduced this construction and now the Marmon car with its sliding gearset uses it. The lower half of the aluminum gearbox is left open at the front end where it expands into a semi-circular receptacle for the lower half of the flywheel with its disk clutch, and the up-

per half is of similar lines. On two partitions in the lower half of the casing are carried the ball races, both entirely protected from dirt. A third bearing is furnished for the mainshaft of the set in the pointed back end of the case, this bearing also being encased, there not being an exposed or even capped bearing in the outfit. This unit case rests on the top of the subframe at two points front and rear. A coupling is placed between the clutch and forward end of the mainshaft to permit of removing one without disturbing the other. The effort to gain proper alignment in the Marmon car has been followed to the letter. The motor, unit clutch and gearbox and driveshaft are carried on a triangular frame with the base to the front and pivoted at each corner on the top of the full-elliptic springs and the apex at the rear adjacent to the differential housing on the back axle. Here it has a trunnion support on the driveshaft, not a universal joint being required in the entire transmitting scheme. The driveshaft is encased in a tubular housing supported at both ends on the subframe pieces.

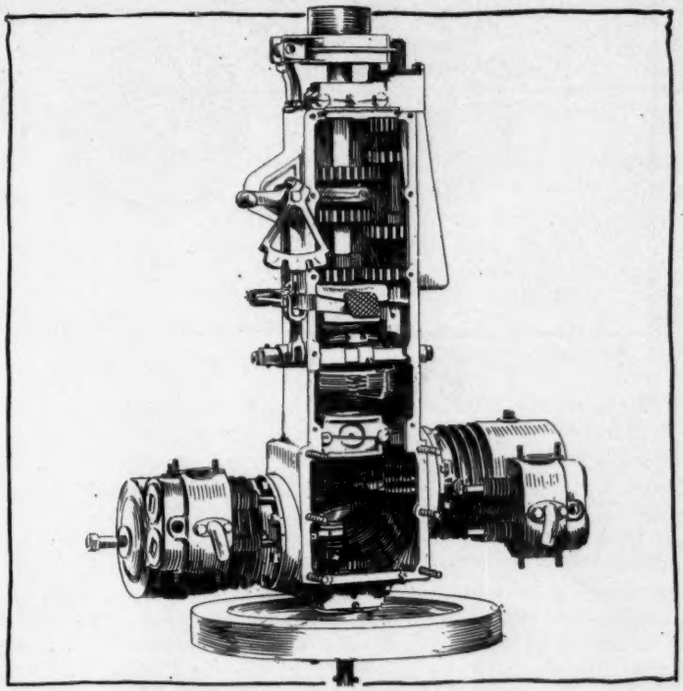
**As Seen on the Rambler**

The first example of unit construction in a two-cylinder opposed motor with the cylinders carried lengthwise beneath the body is that shown in both of the new styles of Ramblers in which the planetary transmission is encased in a dust-proof and oil-tight aluminum housing, which is bolted to a large diameter flange on the right side of the crankbox, thus enclosing the motor flywheels. Both the motor and gearbox in this case are made especially accessible, the former by having its entire top an inspection plate, and by using a couple of camshafts, one at each side of the crankcase, thus leaving the space above the crankshaft and connecting rod bearings open and making it pos-



RAMBLER UNIT CASE—TOP VIEW

sible to adjust them or make replacements without disturbing either of the camshafts. These camshafts are tubular pieces with the cams securely positioned, and are driven by a couple of half-time gears enclosed in the side of the crankbox. The transmission housing has a similar top covering which, when removed, allows the friction bands of the transmission to be adjusted or replaced. The housing not only precludes dust in every possible manner and furnishes a casing for an oil bath, but also adds rigidity to the power plant and makes it possible to use a three-point suspension for it on the car frame. But the Rambler people use a unit construction in their large, shaft-driven car, in which the housing for the sliding gearset is a unit with the housing for the propellershaft and is carried at the forward end of it. Not only are these two parts a unit but the rear end of the driveshaft housing is rigid with the differential and back axle housing, so that from the front end of the transmission to the axle housing is one rigid unit. The transmission set gives the regulation three speeds and reverse and has the mainshaft on top, with the countershaft beneath. Placing the shafts this way makes a small case possible and to secure it to the front end of the driveshaft casing a short funnel tubing, in which is inserted the front end of the driveshaft housing, is needed, this tubing being reinforced by integral webs. Between the flywheel clutch and the gearbox is one universal joint placed immediately in front of the transmission case support, which is in the form of a ball and socket, the latter at-

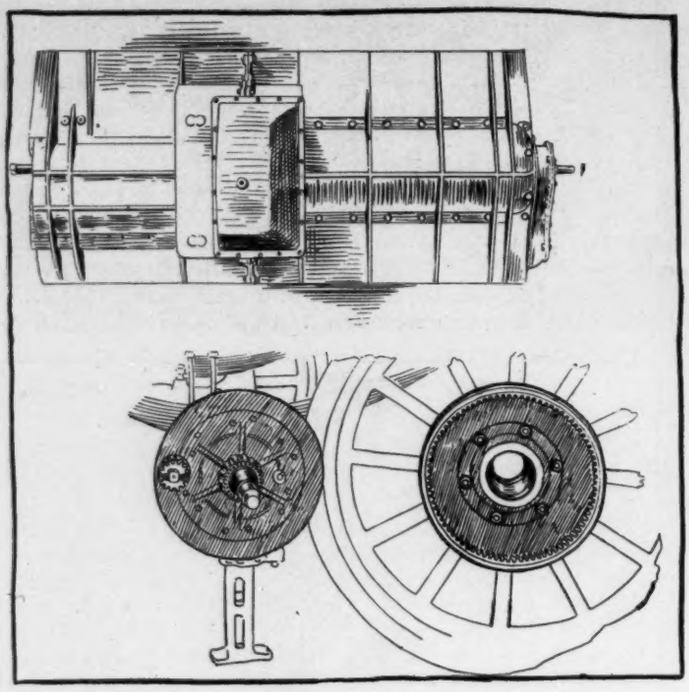


MAXWELL UNIT CASE CONSTRUCTION

tached to a cross piece of the frame and the former on the front end of the gearbox. The ball part is made so as to give a sliding action. In this car full elliptic back springs are used, with the car frame carried on pivots on the tops of them.

**Combined Bevel Gear Transmission and Differential**

The Logan people confine their unit construction to a combination bevel gear transmission and differential incorporated in the housing of the shaft-driven back axle. Formed rigidly with this is the large tubular housing enclosing the driveshaft, this housing having a yoke front end by which it is supported in trunnions from a cross piece of the frame. The one universal joint in the driveshaft has its axis in line with this trunnion support. In this car there is nothing between the flywheel clutch and the rear axle save the driveshaft with its housing. The Logan transmission is decidedly novel, first in that it is of the bevel type, and second because it gives direct drive on its two forward speeds and its reverse. The gears, always in mesh, are secured to their respective shafts by a double clutch arrangement, one clutch for bringing into use either of the pinions on the rear end of the driveshaft and the other for anchoring the right or left bevel on the differential to the differential shaft. A double bearing is provided for the pinionshaft, a long, plain front bearing supported on the two halves of the housing and a rear bearing carried in a bridge support anchored in the top and bottom of the case. This housing, as illustrated, is a two-part affair divided vertically in line with the center of the pinionshaft, having its halves bolted together by a series of bolts extending around the entire casting. The propellershaft housing is in three parts, a funnel-shaped rear one connecting with the front end of the combined differential and gear hous-



BOTTOM OF MORA CRANKCASE—TORBENSEN SPUR GEAR

ing, a central tubular piece, and the forward portion with its yoke ending. In conjunction with this system of drive is the use of a semi-elliptic rear spring without radius or torsion rods, the axle with its large central casting having the support of a couple of truss rods, which are all that is needed.

**Rear Axle Unit Construction**

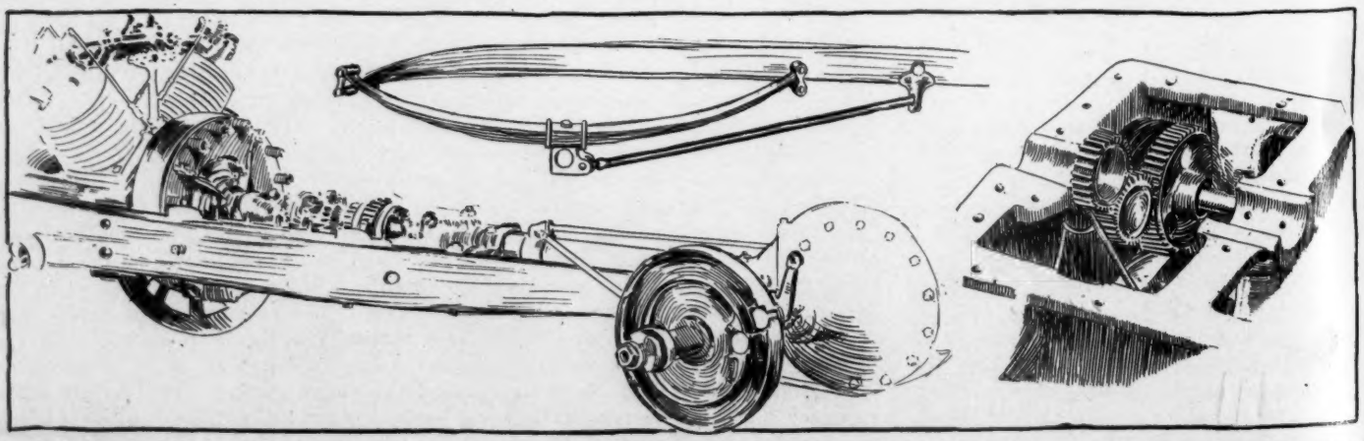
Other firms to introduce this combination transmission and back axle scheme are the Marion, Wayne and Glide. The Marion car uses a type of transmission in which drive is through bevel, spur and pin gears, with the entire gearset carried above the axle line, thus supporting the rear end of the driveshaft 5½ inches higher than ordinary and having it practically in line when the car is loaded. This transmission, described in detail in another place, does not have direct drive but gives the advantage of a unit construction—practically straight driveshaft, and high clearance for the back axle. Its weight is not excessive, being much housing. Supporting it, in addition to the axle tubing, is a heavy truss rod. This drive is without the assistance of either torsion or strut rods, but calls for full-elliptic springs with the frame pivoted on these, and the driveshaft in case. This driveshaft housing is rigid with the gearcase and is supported in trunnions at its forward end, at which point the driveshaft carries its universal joint.

In the new Wayne car the differential case is a unit with the back axle and the housing for the sliding gear transmission rigidly bolted to a front neck of this. This housing is a cylindrical casting, open at the front end, through which the gears are assembled. The driveshaft is not enclosed and carries a universal joint at its rear and another at its forward end. It has the assistance of a torsion rod extending from the gearcase to a cross piece of the frame, this rod taking all strain off the driveshaft save that of propelling the car. In this instance the rear of the frame is carried on semi-elliptic springs and side radius rods are not required, the driving strain of the car being borne by the springs together with the torsion rod. The Glide construction embodies the housing of a sliding gearset with the differential in the back axle, and also housing the driveshaft in a tubular member made rigid at its rear end to the axle housing and supported at its front end by a trunnion bearing at a point where the driveshaft carries a universal joint, there being no joint of this kind at any other point of the system. Strengthening this support are two brace rods connecting from the ends of the rear axle and converging to where the universal joint is carried in the shaft at which place they are connected with the shaft housing, in this way forming a support against lateral strain on the shaft and making the rear axle rotative with respect to the universal joint of the driveshaft.

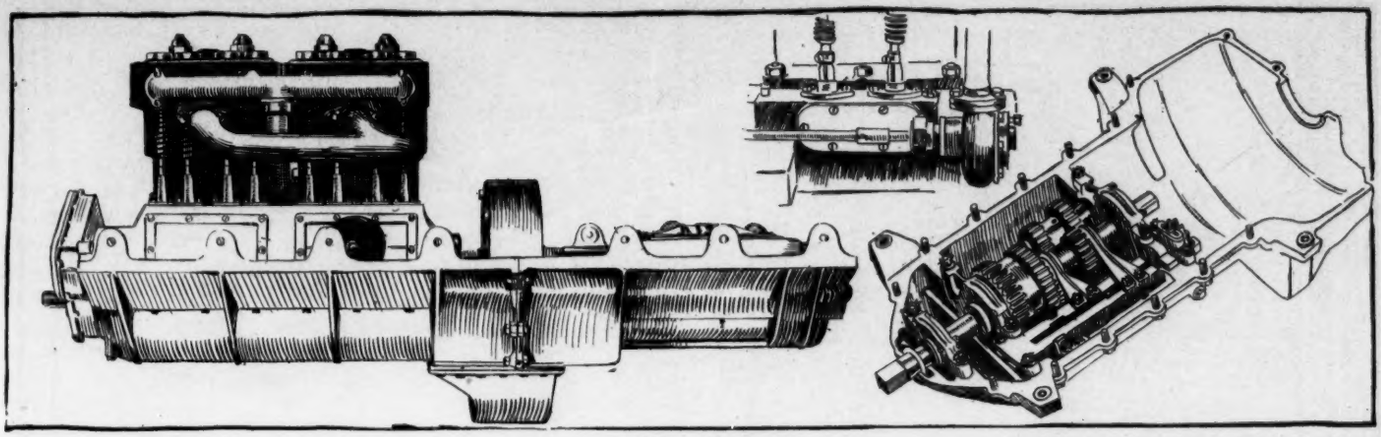
Other unit constructions are the Dorris in which the forward end of the gearset is bolted to the rear end of the crankcase; the Knox motor truck in which the crankcase, gearbox and back axle are practically united and the Torbensen which uses a spur gear drive with a transmission carried on a framework in front of the axle. As illustrated, this car uses a stationary axle and in front of it is a cross piece of the frame, it supporting the combined gearcase and differential. The jackshaft is but a few inches in front of the back axle and carries on either end a small spur pinion constantly in mesh with a large internal spur gear bolted rigidly to, and carried within a drum on the rear wheel. The drive is similar to that employed on electric machines except that the gearing is dustproof. Advantages of this system include that of a stationary back axle and also that of the driveshaft, chains being done away with and an oil-tight, dustproof scheme made use of. From each end of the back axle an angular brace rod extends forward and unites with the frame near the center of the car. Full elliptic springs are employed on the rear axle and on the jackshaft is the usual band brake, connected with a foot pedal.

**Improvements in Shaftdrive System**

While many concerns have been wrestling direcly with unit construction, many others have been making improvements on their shaftdrive system, notable among these being the Stoddard-Dayton, using semi-elliptic springs in the rear and the springs being now bolted direct to the frame itself at their front end instead of being shackled as formerly and to take the driving strain entirely off the springs. Radius rods are used at each side, each being pivoted to the back axle housing and coupled by ball and socket union with a bracket on the side piece of the frame, they paralleling the driveshaft throughout its length. The shaft



MARMON CLUTCH AND CONCENTRIC REAR HUB BRAKE  STODDARD-DAYTON RADIUS ROD  MITCHELL ENCLOSED HALF-TIME GEAR

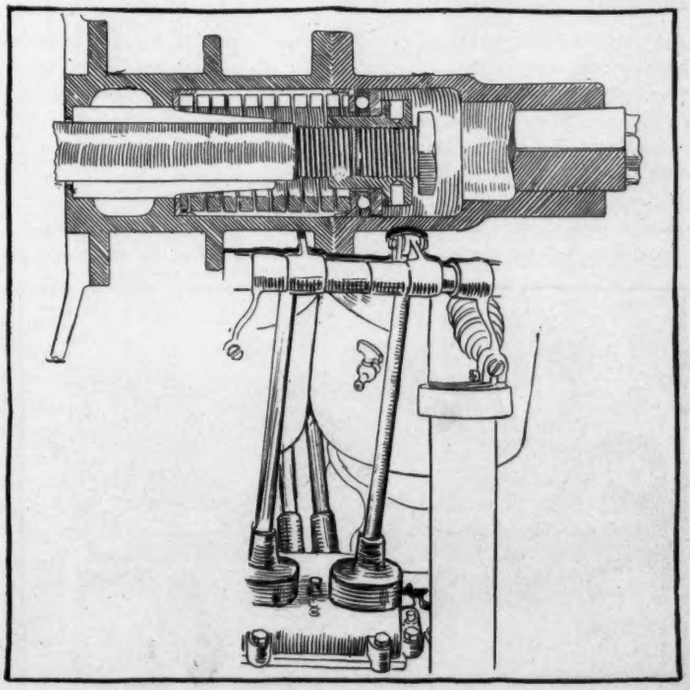


MORA UNIT CASE, TOP VIEW — DRAGON CAMSHAFT HOUSING — MARMON GEAR AND CLUTCH HOUSING

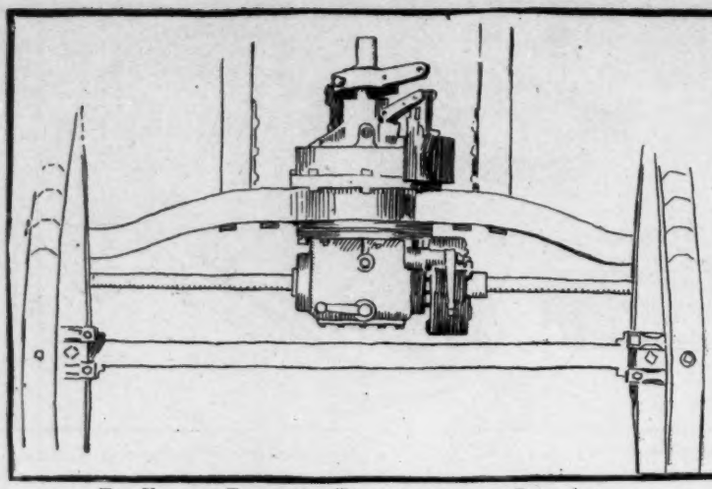
is still enclosed in a tubular housing supported in a ball and socket at its forward end, these supports being in line with the axis of the universal joint of the shaft. The torsion rod which parallels the shaft during the present season, has given place to the side radius rod scheme. The Dragon car, making its debut at this show, uses shaft drive with full elliptic springs in the rear on the top of which is pivoted the frame; and although its driveshaft is not encased and carries universal joints, it is supported by a triangular brace system in which brace rods extend from the outer ends of the axle housing forward to a point on the frame in the rear of the transmission, these rods serving the purpose of a torsion with the additional value of a lateral brace. The Ford company, in its six-cylinder car as well as its four-cylinder runabout, makes use of this triangular brace system, the brace rods having rigid connection at the back axle as well as at the front end where they are attached to a housing on the driveshaft. The sleeve surrounding the driveshaft terminates in a large globe joint within which is the universal joint of the shaft. In the Lambert friction-driven car side chains, heretofore used on all models, have been dispensed with in a couple of models for the coming season, an enclosed shaft scheme being substituted, one in which the shaft is carried well to the right side of the center line of the car, due to the friction scheme of drive. The shaft is housed throughout its length, is without universal joints and has assisting it the use of a couple of radius rods parallel throughout its length and extending from the back axle housing to the bracket supports of the crossshaft on which is carried the friction wheel of the transmission as well as the bevel gear driving the front end of the propellershaft. In this connection, full elliptic springs are employed in the rear, providing pivotal support for the frame. Because of the presence of the radius rods and the tubular housing of the driveshaft, they are free from all strain other than that of carrying the rear of the car. In the new ball-bearing Moore car, although the driveshaft has universal joints at the front and rear ends, yet because of its full elliptic springs side radius rods are required, these being somewhat shorter than the driveshaft but practically parallel throughout its length. To lend additional assistance a V-shaped torsion scheme is adopted with its base anchored above and beneath the axle housing and the apex attached to the rear of the transmission, this shaft being close to and parallel with the driveshaft. Such a combination permits of the use of the driveshaft without a tubular housing as well as full elliptic springs in the rear on which the car frame is pivoted.

### Changes in Frame Construction

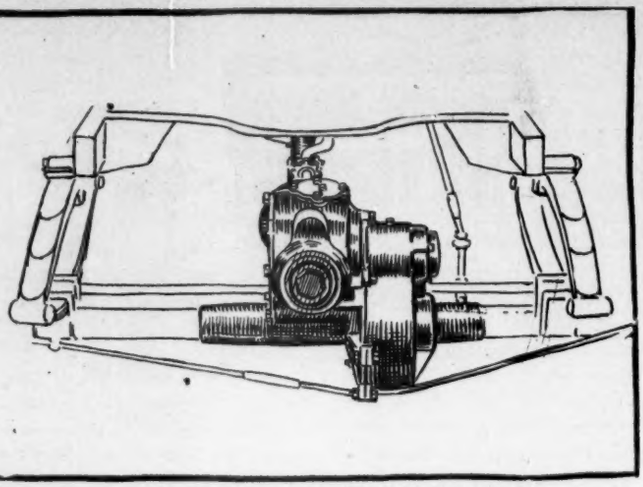
Little attention has been paid throughout the past year to frame construction, the majority of the makers being content with the productions furnished them by the various pressed steel manufacturers. In the Mora car a combination wood and metal is used, the wood part being a selected maple sill of practically 5 inches depth and 1 inch wide, which is stiffened by imbedding in it a vertical plate of armor of 30 carbon steel 3-16-inch thick and 4 inches in depth, this armor being held in place by a series of rivets. The De Luxe car in its chrome nickel steel framework uses a channel section which, although having been in use in America for several years, has a considerable following. The channel is of inverted U cross section with the mouth or open portion facing downward. It has a vertical depth of 5½ inches, a width of 1½ inches, and to lend support the lower parts of the side channels are beaded back stiffening that portion of the frame. This frame offers good vertical depth and also is elastic to side strains. The armored wood frame is not increasing in popularity, in fact it looks very much as if Panhard, the originator of this frame, is soon to be without a following in America. The Grout and Lambert employ this frame. Channel section is invariably used, the exceptions being a few like the Reo runabout, Logan runabout and other light cars using angle steel or angle iron. For commercial work, the angle frame, which had a big start in this field, is gradually losing ground, the channel superseding it. A few novelties in channel construction appear, one being the Moore in which the side frame pieces adjacent to the engine are close together, gradually diverging from the dash to the rear, where they are the full width of the body and are tied together by a stout crosspiece with integral gusset plates extending from the center of this crosspiece to the side frame member. To reduce weight, the gusset plate parts are cut away in the center. This frame is



FRAYER-MILLER LIFT SCHEME—ACME CLUTCH SPRING



TOP VIEW OF TORBENSEN TRANSMISSION AND REAR AXLE

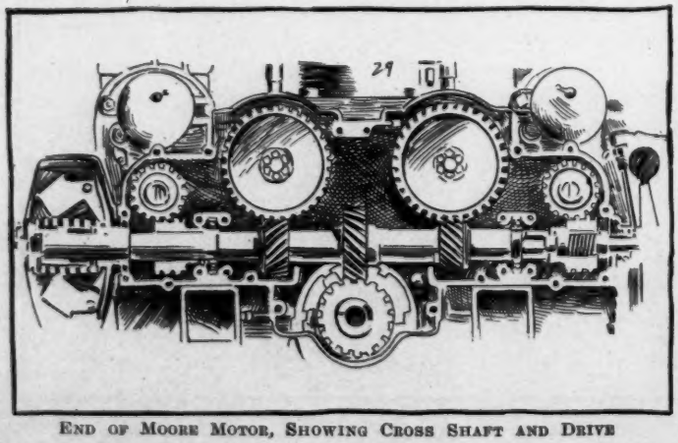


MARION REAR AXLE UNIT CONSTRUCTION

unique in the use of tubular crosspieces, one of which is immediately in front of the back axle and the other in the rear of the clutch. On this one is supported the base of the triangular subframe carrying the motor with the ends of the arms of this frame pivotly carried on it. While exceptionally popular abroad, the upsweep in the frame side pieces above the back axle is entirely wanting in the cars on exhibition, most makers contenting themselves with a pronounced insweep alongside of the motor, thus eliminating the subframe. This latter type of frame has a considerable following, many makers preferring to keep the side pieces on the main frame straight from end to end and adding additional weight by the sub-pieces. Other cars using long brace parts at the back crosspieces are the Logan, Frayer-Miller and Marmon. In all of these full elliptic springs are used and the ends of the braces join the side pieces where the bracket supporting the frame on the springs is attached. The Marmon car still retains its double spring system; a three-point suspension subframe carrying the entire motor plant and another three-point system supporting the body of the car. A pronounced novelty in frame line is the American roadster with its channel frame carried beneath the wheel axles, giving a low center of gravity to the car; and in which the subframe carrying the motor and transmission is several inches above the main frame parts, yet permitting the parts carried to be hung low.

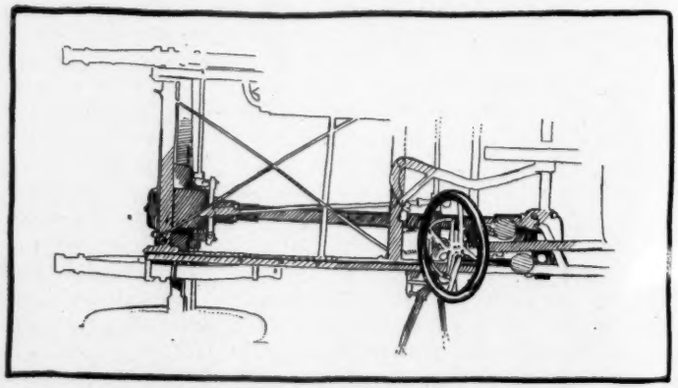
**Full Elliptic Springs in Rear**

A marked tendency in medium-priced, and including a few high-priced cars, is that of placing full elliptic springs in the rear, many makers realizing that with this style of spring easy riding is insured. The new Moore car uses these springs in the rear as do the Marmon, Frayer-Miller, Welch and such medium-priced machines as Premier, Rambler, Lambert, Moline, Dragon, Reo, Torbenson, Logan, Rapid, Marion and Ford runabout. In most cases where these are used the framework is carried in a rocking support on top of the springs and brace rods of some description



END OF MOORE MOTOR, SHOWING CROSS SHAFT AND DRIVE

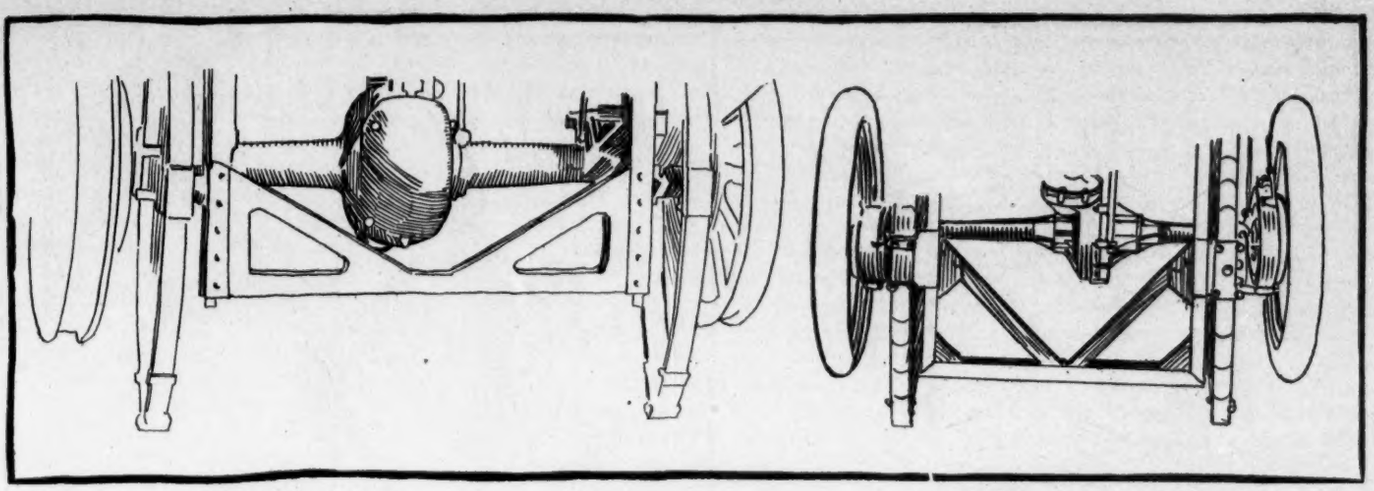
with its I-beam front axle, the spring seating is formed inteused to take the driving strain off them. Where full elliptics are used in front they are generally carried beneath the frame, the Premier car being an exception, forged brackets being attached to the side piece of the frame and resting on top of the springs these brackets, having portions for carrying the fender and lamps. The Moline introduces the transverse front spring shackled at either end to a lug on the steering jaw and carrying above it the crosspiece of the frame. Driving strain is absorbed by radius rods running from the axle ends to midway of the frame. The Mora car uses a similar suspension in front with a platform system carrying the back part of the car. The Ford runabout is a third example of the transverse front spring and the brace rods supporting it converge to beneath the gearbox support where they are attached by ball and socket union. In practically every car a perceptible lengthening of the springs is apparent, a few makers have added additional leaves and not a few have increased the width of them. In the 1907 Rainier



LAMBERT SHAFT DRIVE OUTLAY

grally and the clip holding the spring in position has its two arms passing directly through the axle instead of using double clips, with these anchored to the spring seating. Where the clip studs pass through the axle, it is bossed between the top and bottom axle flanges.

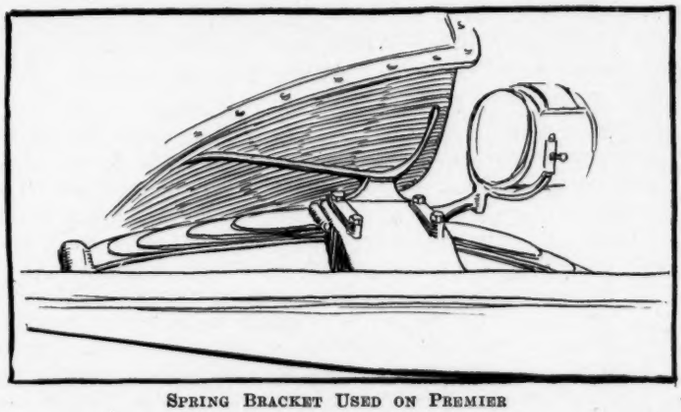
No tendency is more pronounced than that of placing the regular and emergency brakes on the rear hubs, making the former friction bands operating on the outer surface and the latter expanding shoes. More than a score of makers have adopted this rule. Regular brakes on the driveshaft are waning in popularity. The Marmon and National cars make both regular and emergencies in the form of expanding shoes within the rear hubs, requiring for this construction two drums formed concentrically, the regular brake operating within the smaller or larger according to the dictates of the designer. On this year's Lamberts a running brake has been placed on the crossshaft of the friction transmission; the Mitchell machines place both brakes



MOORE FRAME BRACES

FRAYER-MILLER REAR FRAME BRACES

within the back hubs, as do Pungs-Finch, Wayne, Mora, Logan, Rambler, Moore, Triumph, Pierce-Racine, Moline, Maxwell, Welch, Berkshire and others. On the Acme is fitted also a sprag for preventing running backward on hills. In the majority of other cars changes have been added in increasing the brake drum diameter and widening its surface, the general impression being that the '06 cars have not sufficient braking service. The Dorris' running brake on the transmission shaft is a clamping band lined with camel's hair and featured by its accessible and quick-adjusting features. On the ends of the band are lugs through both of which pass the tightening bolt, carrying on one end a nut and locknut and on the other a jaw to which is



SPRING BRACKET USED ON PREMIER

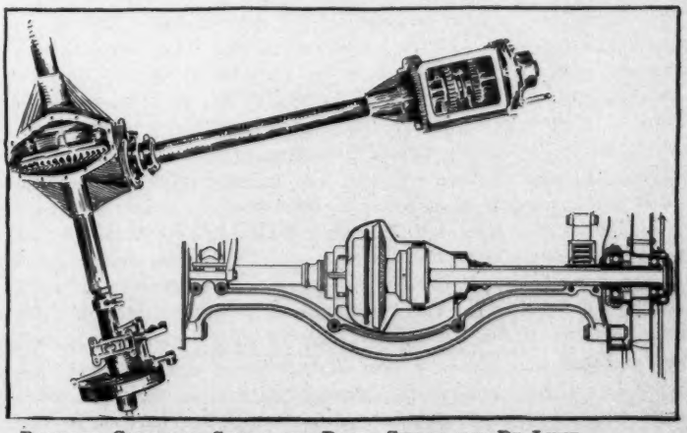
pivoted a bellcrank. The other end of this bellcrank has connections to the brake pedal and the crossarm rests on an adjustment stud in an adjacent lug pressing against it for tightening the band. Between the ends of the band is a coil spring for brake release. Adjustments are made by means of the stud or the nut and lock nut on the end of the tightening bolt.

**Not Much Change in Motor Design**

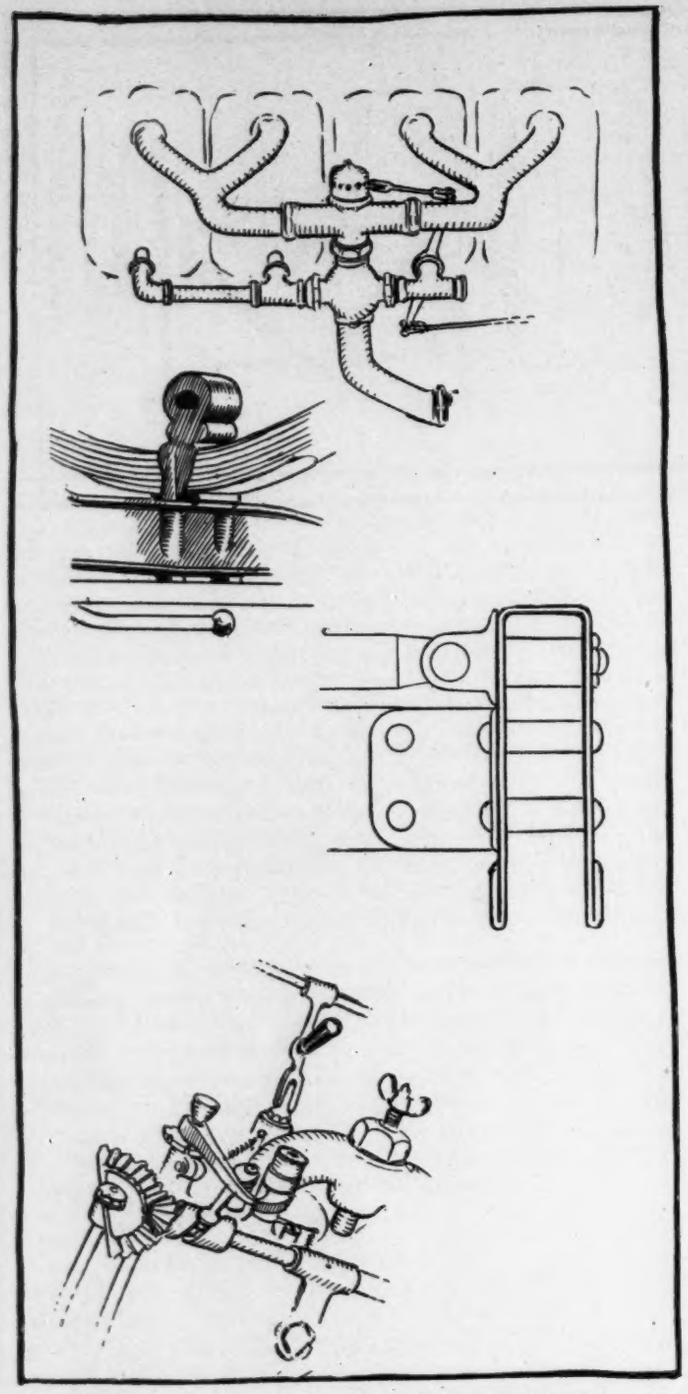
Motor design in general remains as during the present season, there not being the expected landslide to the placing of the valves in the cylinder heads and operating them by overhead rocker arms. A few firms, however, adopt this principle, among them the De Luxe in its 50-horsepower car. This is the most novel scheme of the lot. The valves, carried in the cylinder heads on opposite sides, are mounted with their stems at an angle of 20 degrees to the vertical and the intake and exhaust valve of each cylinder are operated by the same rocker arm. This is accomplished by having one end of the rocker arm pivoted to the top of the lifter rod rising from the camshaft within the crankcase. The camshaft carries a compound cam with a raised portion for lifting the lifter rod when the exhaust valve is opened and a concaved part into which the lifter rod is forced by its spring at which time the intake valve is opened, the remainder of the cam being a medium-diameter part for holding both intake and exhaust valve closed on the compression and explosion strokes. Double adjustments on this rocker arm are provided for the careful timing of both valves. Such firms as the Mitchell, Welch and practically all of the air-cooled makers retain the valves in the head the rocker arm action. A pronounced tendency, shown in cars ranging in price from $2,000 to $2,500, is to place the valves on opposite sides, using a couple of camshafts, a construction allowing of large-diameter valves as well as an excellent cooling of them. The Frayer-Miller motor is somewhat simplified by the use of one instead of two camshafts as formerly, using it for opening intakes on one side of the cylinder head and the exhausts on the other, this necessitating angular lift rods rising between the cylinders for opening the valves on the opposite side of the motor.

**Tendency to Increase Camshaft Accessibility**

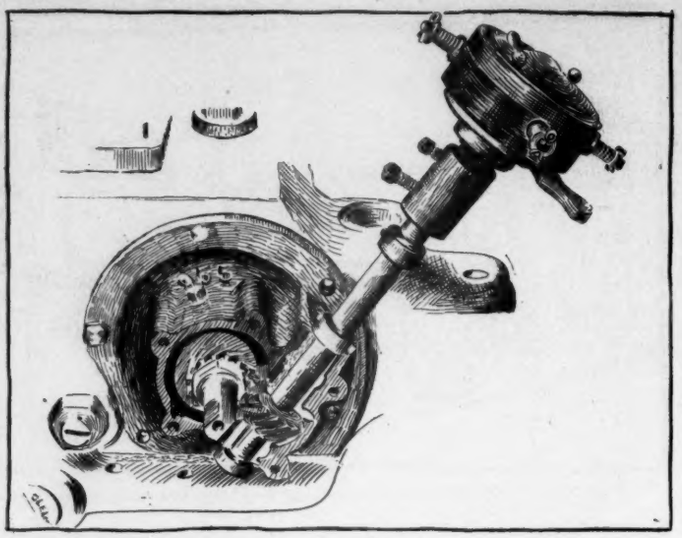
Next to that of valve accessibility is a decided turning to accessibility in reaching the camshaft, many makers now using extra large bushings and locking them in position so the camshaft with its bearings can be removed lengthwise through the front bearing opening in the crankcase, the radiator, of course, having been previously removed. In the new Dragon car camshafts on opposite sides are housed in box-like compartments in the top of the crankcase and large inspection plates are placed opposite the cams for the front and rear pairs of cylinders, facilitating examination and repair of these cams without removing the shaft. In the Mitchell motor the camshaft is encased in the lower side of the crankcase at the right and the half-time gears, together with the idler, and crankshaft pinion, is placed in the front end of the crankcase, the large half-time gear reposing in the hollow supporting arm of the case. This concern also shows an innovation by driving its commutator by spiral gear off the forward end of the camshaft and carrying the commutator shaft at an angle of about 40 degrees to the vertical,



RAMBLER COMBINED SHAFT AND DRIVE SHAFT AND DE LUXE



HARRISON INTAKE
CLEVELAND SPARK ADVANCE
RAINIER FRONT SPRING CLIP
DE LUXE FRAME SECTION



MITCHELL'S COMMUTATOR DRIVE

this angle being such that the commutator is well removed from the engine and is most convenient for examination. The spiral gears are fully enclosed and operate in oil. The Moore motor takes a position all by itself in its method of driving its cam and magnetoshafts. Extending crosswise of the crankcase in front is a shaft with four spiral gears—a central one by which it is driven from the crankshaft, two others for driving the camshafts, and another pair for the magnetoshafts. All these gears are compactly encased in a separate compartment to which oil is fed under pressure. Interesting also in this Moore motor is the compound crankshaft revolving on five Hess-Bright bearings and made up of four U-shaped pieces, the crossarm of each forming a bearing for the lower end of a connecting rod. The side portions of the U forged circularly with a central opening, are clutched and bolted to the inner race of the bearing. The shaft is a chrome nickel steel product with large diameter bearings on the connecting rods. All bearings are carried in the upper half of the case. Other firms using the ball-bearing crankshaft this year are the De Luxe and National. Still another change noted in the Moore motor is that of making the lower half of the bushing in the connecting rod much shorter than the top half, the aim being to assist the lubrication, the crankpin being more exposed to the splash which in this particular case is augmented by the presence of a trough-like device beneath each connecting rod, this trough being constantly filled with oil into which the end of the rod dips. Before leaving the subject of motors, attention is called to the method now used of supporting the entire motor of the Jackson two-cylinder car in which the cylinders are carried crosswise in front of the dash. On the top of the frame at each side is a bearing box supporting a stud threaded into the cylinder head.

**Use of Thermo-Syphon Circulation**

Thermo-syphon circulation of the cooling water has but a slightly increased following—not what it deserves. The Jackson runabout, with its cylinders mounted crosswise in front, is a favorable example of this. Large diameter piping, one for each cylinder, lead from the bottom of the radiator at each side and enter the lower portion of the waterjackets. From the top of the jackets separate return pipes lead to the right and left top of the radiator. Steam hose is used largely in this system, it being of large diameter. The capacity of the radiator is slightly increased. The company claims from tests to have received better results from this cooling system than they did with the same motor cooled by a positive pump circulation. The Carter-car is another exponent of thermo-syphon cooling. Compared with the Jackson thermo-syphon is the pump system employed on the Ford runabout which has its rotary pump placed in front of the radiator and its axle piercing the radiator and gear-driven at the other side of it off the crankshaft. The pump draws its supply through an opening surrounding its axle from the radiator and delivers it to the waterjackets through a small-diameter pipe dropping beneath the radiator, then rising to the side of the cylinders. Tubular radiators are gaining favor. National cars are now fitted with them and such new machines as the Dragon and a few others have adopted them. At present the field is equally divided between this and the cellular type.

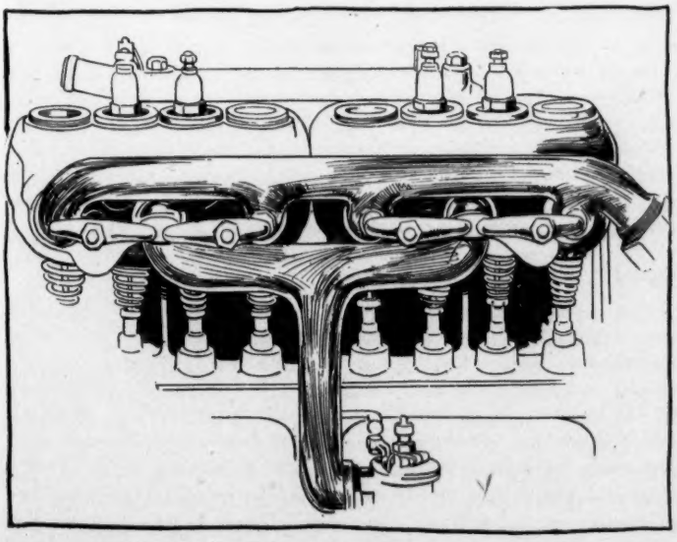
Disk clutches so favorably discussed 1 year ago have not made the anticipated progress, partly due to the fact that sticking of the plates, resulting in slow declutching, is the result. This is largely due to the nature of oil used and the attention given the disks by the car driver. A good grade of oil and an occasional cleaning with gasoline avoid this trouble. Those employing the disk clutch for the second season are using fewer disks and instead of having the engagement by a stiff spiral spring surrounding the shaft a series of springs located near the peripheries of the disks is used. The new Dorris clutch demonstrates this with its three springs distributed in a circle,

the differential housing to the stationary part, this housing also on the disk carrier surface at 120 degrees to one another, which gives a more even pressure on the surface of the disks and more positive dripping action. The hub spring frequently engages the inner part of the disks while the outer parts are not gripping, owing to the springing of the metal of the disks. In this clutch is shown also a little device in the form of a pressure brake acting on the clutch carrier carried on the transmissionshaft. In declutching the carrier is drawn back against this brake at which time its motion is retarded and changing of speeds facilitated. The brake used is a wooden block backed by an iron plate with a stud pushing forward on it through the tension of a coil spring surrounding the stud. A few other cars have fitted similar brakes. In the Marmon disk clutch a series of nearly a dozen small spiral springs acting on the peripheries of the disks is used for engagement. These several springs give a positive engagement but require an equal tension which means frequent examination of them for testing their tension. The expanding clutch and the clamping drum clutch have a very limited following with the cars exhibited. A simple clutch spring is used in the Acme cars. The clutch spring is held at its rear end against a flange in a tube threaded onto the tail end of the crankshaft, and threaded also into this tubing is a lock nut, which is very accessible. The tube with its flange can be adjusted at will, and then secured by the locking stud.

A few firms have made good strides in providing baggage space within the car body, one of the leaders in this regard being the new Stoddard-Dayton in which a deep compartment is located in the tonneau floor, this floor inclining forward, giving a brace for the passenger's feet. The compartment is reached by a lifting door in the floor. In this car another large space is provided beneath the rear seat. The car has a neat tool box in the divider in the front seat. This is useful for spare bolts and small parts and being narrow is not detected.

### Jackshaft End Bearings Strengthened

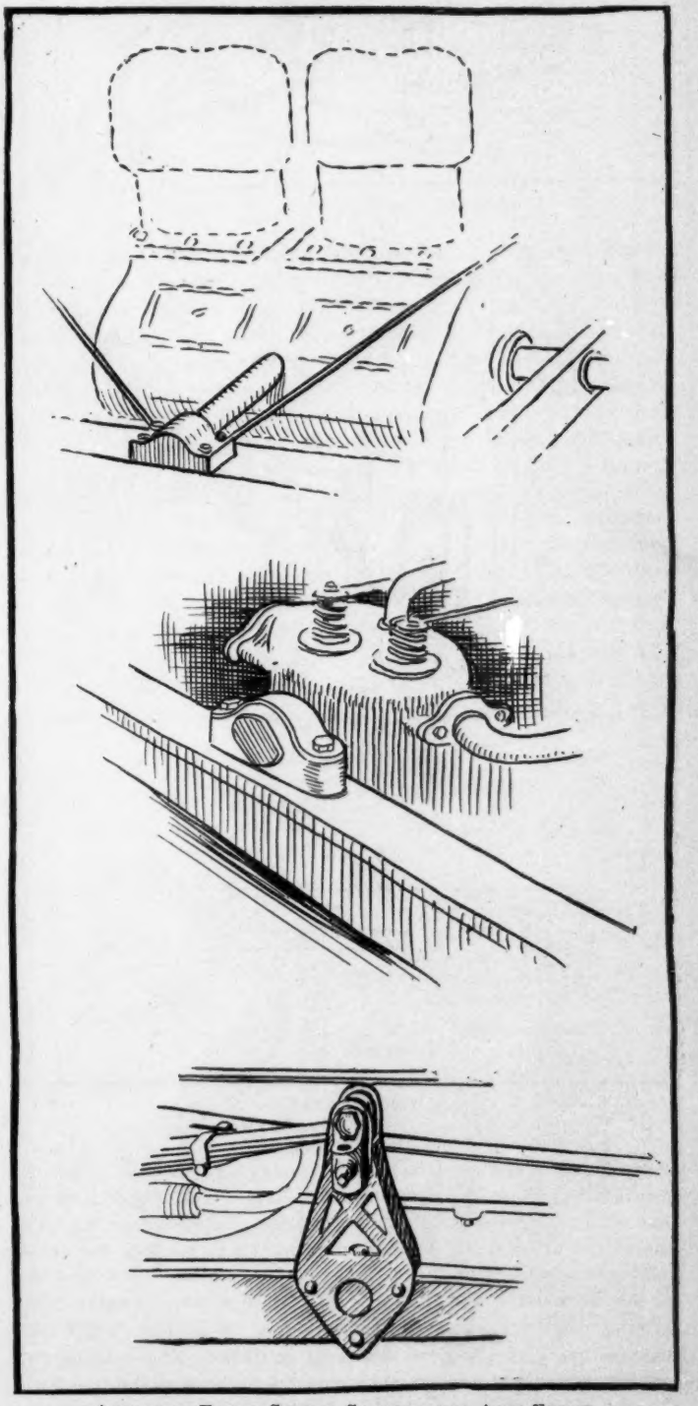
An improvement is added for 1907 in the Crawford car in that the end bearings of the jackshaft have been strengthened by the interposing of strut rods between the brackets carrying the end bearings of this shaft and the rear axle housing. The end of the jackshaft is carried in a coned housing, in turn surrounded by an adjusting ball cup-holder, the latter clamped in place by the bracket to which the radius rod is attached. This construction is to prevent strain on the jackshaft and its gears should the frame of the car suffer a wrench or strain sufficient to put the jackshaft out of alignment were its end bearings stationary. This socket-like bracket is in turn supported through a ball-bearing from the main frame. The presence of the radius rods preserves an even tension of the side drive chains.



PIPING ON THE FORD FOUR-CYLINDER RUNABOUT

A high-water mark in back axle construction appears in the new De Luxe car with its combination stationary and live design, a style entirely new in America but one which has for some time been exploited in France. The stationary part of this axle, an I-beam chrome nickel steel forging, is centrally dropped, not unlike many front axles, save that the drop is less pronounced. This stationary part extends from wheel to wheel and carries the entire weight of the car and on its ends carries the ball races on which the road wheels revolve. The De Luxe car, of the shaft-drive type, has its differential and axle driveshafts carried on the stationary axle, the differential housing resting in the center of the dropped part and the axleshafts extending through the bored ends of the stationary axles and driving the road wheels by hub caps as in any floating axle. Enclosing these driveshafts between the differential housing and where they enter the bored ends of the stationary axle, adjacent to the road wheels, are compression sleeves which aid in binding

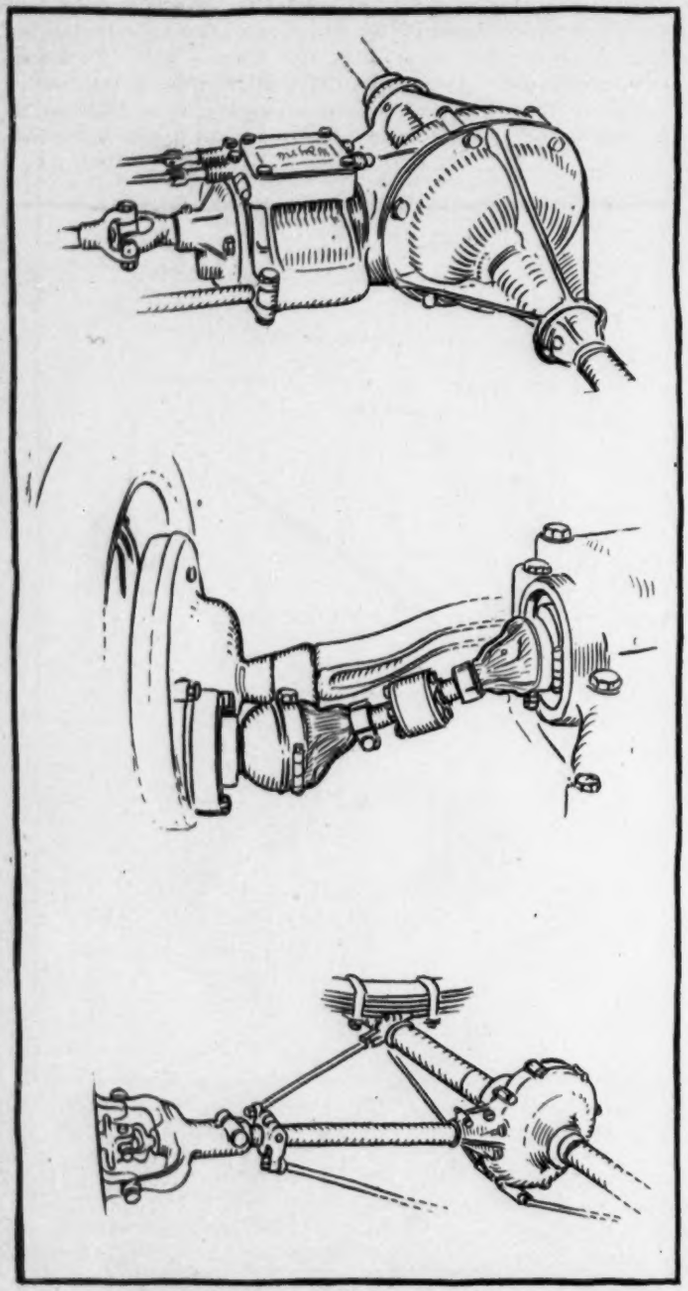
SIMPLICITY ENGINE
JACKSON MOTOR SUPPORT



AMERICAN FRONT SPRING SUPPORT AND AUTO-FRAME

being attached direct to the stationary axle by a couple of stradddle seatings made a reamed fit over the axle, then bolted thereto. The axle has all the advantages of a stationary axle as used with side chain drive as well as those connected with floating, shaft-driven axle. The car with 36-inch rear wheels has a clearance of 9½ inches at the axle center.

In the Craig-Toledo runabout the subframe is independent of the main frame and consists of two pressed steel channel sections running parallel from the front cross member of the main frame, to which they are hinged, to a point in line with the back end of the gearcase. From this point the channel pieces slope

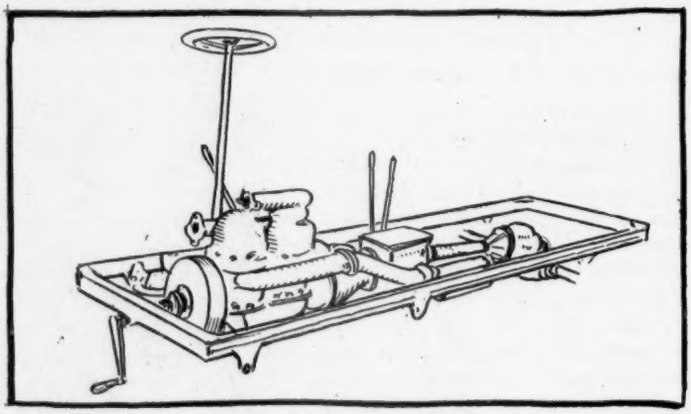


WAYNE MODEL N UNIT GEAR CASE
PILIAN TRANSMISSION—DRAGON BRACE SUPPORT

inwardly and are attached to a casing which surrounds the forward extension of the differential housing. The subframe has cross members for strengthening purposes. Attached to the back side of the after cross member is a bearing to support the driveshaft and attached to this bearing casing are two rods reaching to the back axle immediately under the spring hangers, thus forming braces against twisting of the axle. The motor and gearcase are suspended on this cross subframe, which, of course, is somewhat sloped, so that the motor is also sloped. The main frame is supported at the rear on full elliptic springs. By removing the back spring clips and brake levers and removing the pins that support the front end of the subframe on the main frame the subframe of the motor, transmission and rear axle may be removed from the main frame.

In the runabout of the Detroit Auto Vehicle Co., which has an opposed motor placed crosswise in front, a peculiar form of cone clutch is used. The flywheel is keyed on the crankshaft back of the crankcase. Further back on the crankshaft is carried the female member of the cone clutch. This member resembles a saucer placed on edge and is stiffened by radial flanges. The male clutch member, carried on the front end of the transmission shaft, is a simple leather-faced cone held into engagement by a stiff helical spring requiring 800 pounds to compress the spring ⅝-inch. The Cleveland company retains its make-and-break ignition system, with all parts carried on the top of the cylinders and the current furnished by a Simms-Bosch magneto. This year the entire mechanism is housed in an aluminum cap held in place by studs, and a marked improvement is made in the method of advancing and retarding the spark, which was done on the 1906 cars by a complex arrangement, but is now accomplished by a worm carried on a horizontal shaft along the cylinder heads. There is a worm on a rotating shaft for each cylinder and the cam which trips the operating lever has an arm extending toward this rotating shaft with a vertical pin in the end of the arm. This pin, resting in the thread of the worm, revolves the rotating shaft, the cam carrying the arm forward or back, bringing a deeper or shallower part of the cam against the operating lever and so varying the time of the spark.

Instead of a toggle joint the Delahaye band brake on the forward end of the transmission shaft is tightened by a couple of quick pitch worms, one right-threaded and the other left-threaded. Each end of the brake band is a large lug, through which



ATLAS TWO-CYCLE TRUCK

passes a cross shaft carrying the right and left worm threads, there threading through the lugs. On the end of the worm shaft is a short arm connecting with the brake lever.

A strong brake construction is used on the jackshaft of the Westinghouse. The clamping parts are two metal arcs, one bearing on the top of the brake wheel and the other on the bottom. These bands are hinged at their forward ends to a cross piece of the frame and their rear ends are coupled to the tightening members. Coil springs are used for releasing the bands. The Westinghouse carbureter also carries with it novel features.

### Changes Made in 1907 Carbureters

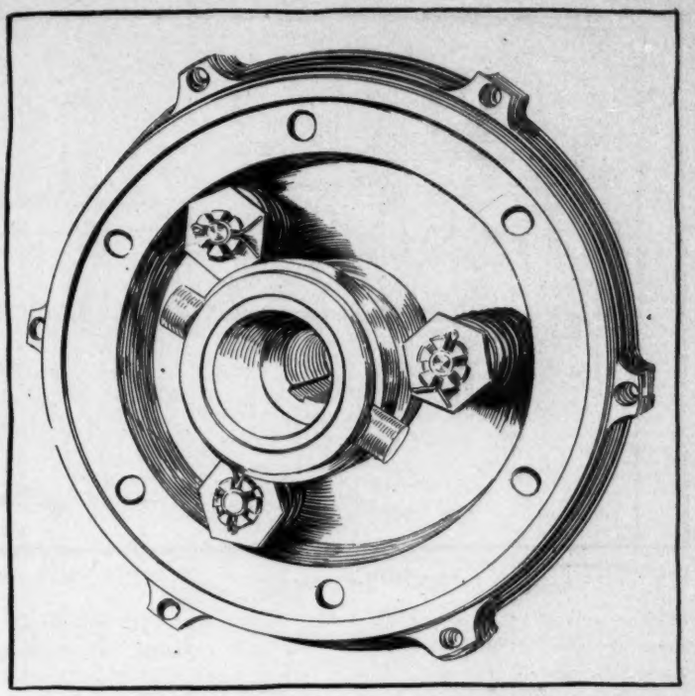
The carbureter on both the foreign and American Mercedes cars has been entirely changed. Its general shape is that of a quarter-turn elbow, the final gas feeds being through a two-way T with a branch, one for each pair of cylinders. At the center of the bend is an automatic shutter, the cross section shape of which is that of half a conventionalized heart. On the approaching edge is a groove that looks very much like a shoe horn with a concave face at the front and the small end of the concave part at the bottom. While this gives a tapering groove, the shutter itself has straight sides, being the same width from

top to bottom. Into the restricted space made by the concaved groove at the point or lower edge of the shutter projects the needle jet. This groove in the shutter forms the top half of a semi-circular bridge, giving a restricted air passage of about ¾-inch diameter, to insure a good velocity of air when the main throttle is closed or the pistons are running at slow speed. The spindle on which the shutter hangs projects through the outside wall of the carbureter, where there is a pointed oval tip. Pressing against this tip is a light flat steel spring, the tension of which can be varied by a milled head thumb screw. The tension of the spring is not at any time set to prevent the shutter returning to its dropped position by virtue of its own weight. At the top of the elbow is placed an ordinary barrel throttle. This gives a swinging air-controlled shutter, the sensitiveness of which is controlled by the flat-plated spring on the outside. The gasoline jet is adjustable by an outer steel screw needle. The carbureter as a whole is waterjacketed. The design of this carbureter, taken in conjunction with past devices of this nature used by the Mercedes people, shows that they have finally gone away from the complexity of carbureter design which seems to be yet favored in Europe and have adopted the principle, the matter of shape and form being a detail, that is prominent in all present-day American carbureters, which are quite distinct from European practice as to the laws of physics.

### Wayne Unit Gear and Back Axle Housing

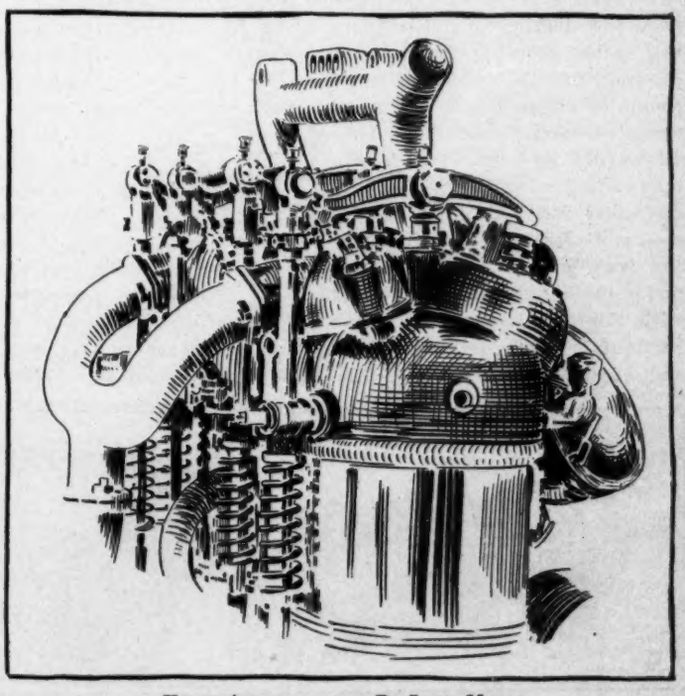
The most decided departure evidenced in the new Wayne construction in its model N car is the unit gear and back axle housing, already referred to. This unit case follows the style pursued in Packard cars for several seasons, a style that had a very limited following until the present season, when it has come into general use in one form or another. The differential housing of the Wayne is split vertically, its two halves resembling opposing funnels, into the small end of each of which is secured the axle tubing. The forward side of these housings when together form a forwardly projecting neck which is continued to the front in an expanded shape, forming the side walls, the top and the bottom of the gearbox for the sliding nest of gears. In assembling the gearset, shafts and gears are introduced through the front end, left open for this purpose, and closed by a large plate carrying also the front bearings for the main and countershaft of the gearset. On the top of the gearbox is a separate boxlike compartment encasing the shifter rods for the two sliding sets within the case, changes in speed coming through selective operation. Because of the extra load placed upon it the differential housing is heavily webbed between its largest diameter part and the small ends in which the axle sleeves are received, which reinforcement is assisted by underneath truss rods from end to end of the axle. In removing the gears of the transmission the work is limited to disconnecting the driveshaft from the motor, and removing the front end plate of the gearbox; but to get at the differential the back axle has to be removed and disassembled. Lubrication of the gears and shafts is cared for by separate leads from the mechanical oiler carried beside the motor. In the driveshaft, between the flywheel and transmission, is a typical universal joint for caring for differences in alignment due to spring action.

Coming from a point further west than any other car at the show, the innovations of the Smith car, while many, give particular interest, as by them a slight appreciation is met of the advances made by the west in car design and construction. A feature used a few seasons ago on one or two cars made in the central states, but recently dropped by them, is shown on the Smith, it being the telescopic steering column, by which the steering wheel can be raised or lowered according to whims of the driver, the radius of movement being a slide of 7½ inches. Nothing out of the ordinary is required in the design of the column to achieve this, the sliding part being a tube acting within a larger diameter tubing, a long key anchoring the two for rotation purposes. Mounted on the steering wheel are spark and throttle finger levers, one supported on a tube concentric with the steering column and the other on a central rod, both

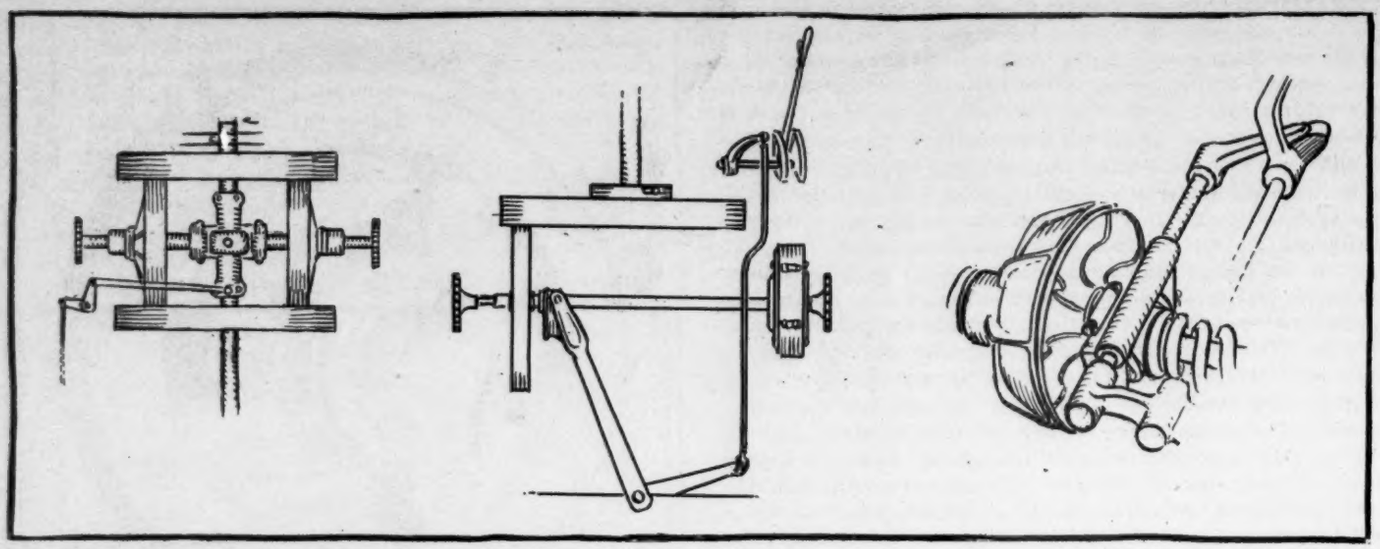


CLUTCH USED ON THE DORRIS 1907 CAR

the tube and rod telescoping, the former in a method similar to that of the steering column itself. The rod raises or lowers through a long sleeve on the bellcrank at its base, through which connection is made to its respective part on the motor. A setscrew in the side of the steering column anchors the column at any required position. A second innovation on the car is the use of cone clutch brakes acting in drums on the back wheels, the female part of the clutch being formed integrally with the wheel hub. A second concern shows a novelty in rear hub brakes in that they are multiple disk clutches carried within housings in the rear wheel hubs and applied by standard engagement. Returning to the Smith car, it uses a peculiar form of unit gearcase and rear axle construction, in which the case, carried amidship, is rigidly secured to the axle housing through a large-diameter sleeve which houses the propeller shaft. Stiffening this construction is a pair of brace rods converging from the axle ends to a collar clamped on the forward end of the



VALVE ACTION OF THE DE LUXE MOTOR



EVANSVILLE FRICTION TRANSMISSION — LAMBERT SHAFT DRIVE OUTLAY — AUTO VEHICLE CO.'S CONE CLUTCH

tubular driveshaft housing, to which they are rigidly attached. They are similarly secured to the rear axle housing. The multiple disk clutch is housed in the forward end of the gearbox, and supporting the box at its forward end is a ball and socket scheme, the socket carried in a cross piece of the car frame, the ball being an expansion on a sleeve extending from the gearbox. Immediately in front of this support is the only universal joint in the transmission system.

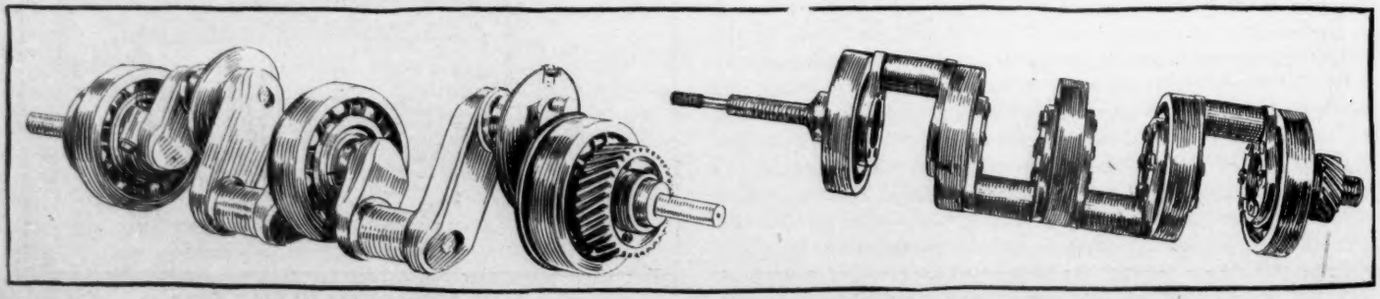
**Unique Method of Heating Mixture**

In the Harrison car a unique method of heating the air or mixture passing to the motor is achieved by having the vertical intake pipe pass through an expansion in the horizontal water pipe, the result being a heating of the mixture-preventing possible condensation—and at the same time the water is proportionately cooled, also a desirable result. A four-arm union is needed where the pipes intersect. Formed in conjunction with this union is a valve connected with mixture pipes with the atmosphere, through which air may be drawn to the cylinders when descending a hill, at which time the motor can serve in the capacity of a brake. Before this valve is brought into use the connection with the carbureter is cut off and that with the outside air established, both results being gained by the driver from the steering column. Owing to its self-starting motor and this system of using the motor as a brake, a quite heavily laden steering column results, it carrying on the steering wheel a couple of finger levers, one for the spark and the other for the throttle. Carried on the steering column a little more than midway of its height are three other levers, one for letting air into the cylinders, serving as a brake when descending hills, and the other for controlling the self-starting devices. While this company uses a self-starting motor in which acetylene gas from the lamp generator and compressed air from a tank located under the chassis are used for filling the cylinders, it combines with this system a simple compression relief in the form of a horizontal shaft carried along the cylinder heads at the left and having arms resting on the tops of the automatic intake valve stems. This rod extends through the dash and carries on its rear end a small crank located convenient to the driver, a light pressure on it opening the entire set of valves as much or as little as desired.

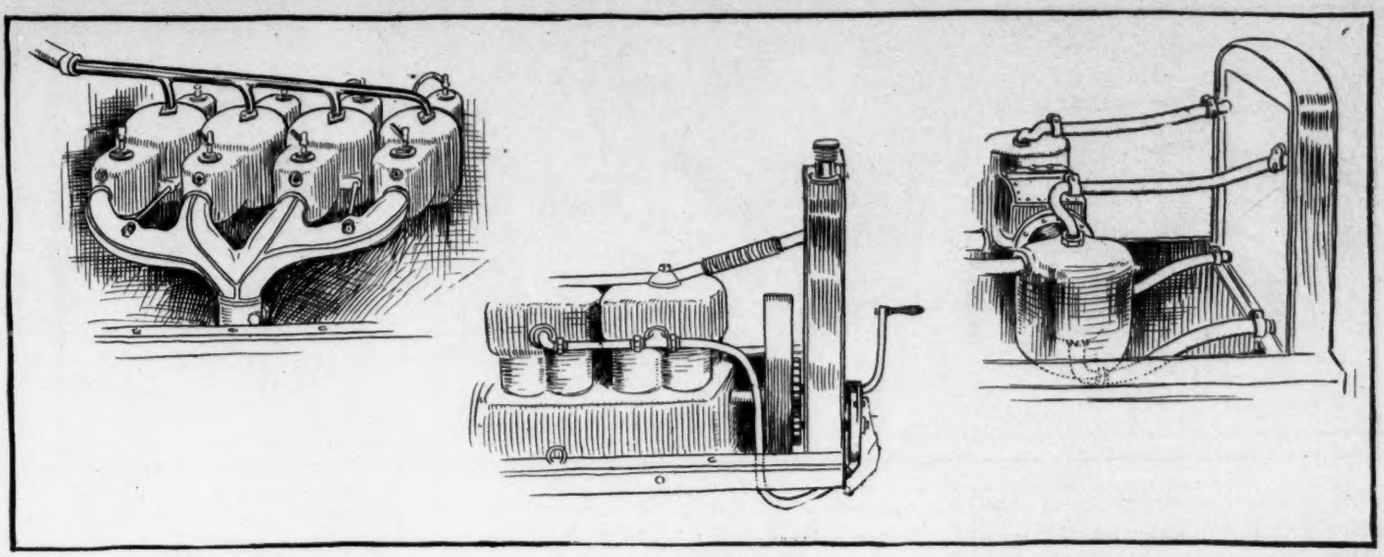
Most of the high-powered runabouts, so many of which are fenders, bonnet and a single rear seat, have dashes as varied as their fenders. Of these dashes that used on the Frontenac is without a rival in that it is a baggage compartment as well as dash. It is very deep from front to rear and its rear end is a long sloping cover serving as folding doors to reach the interior and also as a footboard as well as location for the coil and a few of the other necessaries of the car. Making it so large affords accommodation for suit cases, tool boxes, generator for the lamps, lap robes, tire casing and cover and leaves the entire rear deck of the car free for the carrying of the folding rumble seat. Of the dashes used on touring cars that of the English Daimler attracts because of the long cabinet at each end of the dash, each compartment being divided into four or five compartments, one above the other and all enclosed by the same swinging door. Just within the top corner of the dash is a small shelf, fully enclosed, and in which is carried the switch of the electric system. Other feature to be seen on this car is the flanging of the top part of the watertank above the radiator, the result being the same as that gained by air-cooling cylinders by circular flanges. A third feature in this car is the folding bonnet, a commendable construction. The bonnet is in three parts, the sides hinged at their bottoms to the frame and swinging out against the fender and the top hinged at its back end to the dash and swinging up clearly out of the way and having a brace rod to hold it so. By this arrangement the trouble of lifting heavy centrally hinged sides, or lifting parts of the bonnet off is done away with and yet the motor is accessible.

**Three Using Friction Transmission**

Friction transmission remains where it was a year ago. Three concerns show it—the Lambert, Cartercar and Simplicities. In all three the general principle is the same, consisting of large



DE LUXE CRANKSHAFT — MOORE CRANKSHAFT

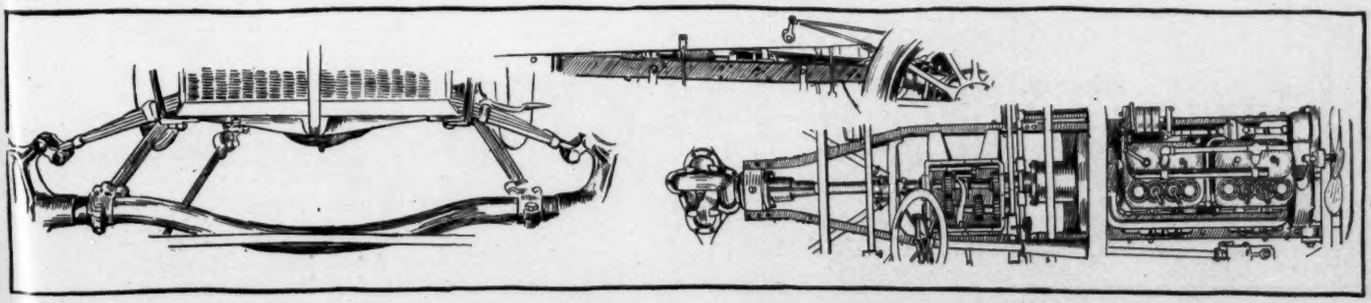


PREMIER STAGGER | FORD RUNABOUT WATER SYSTEM | JACKSON THERMO-SYPHON SYSTEM

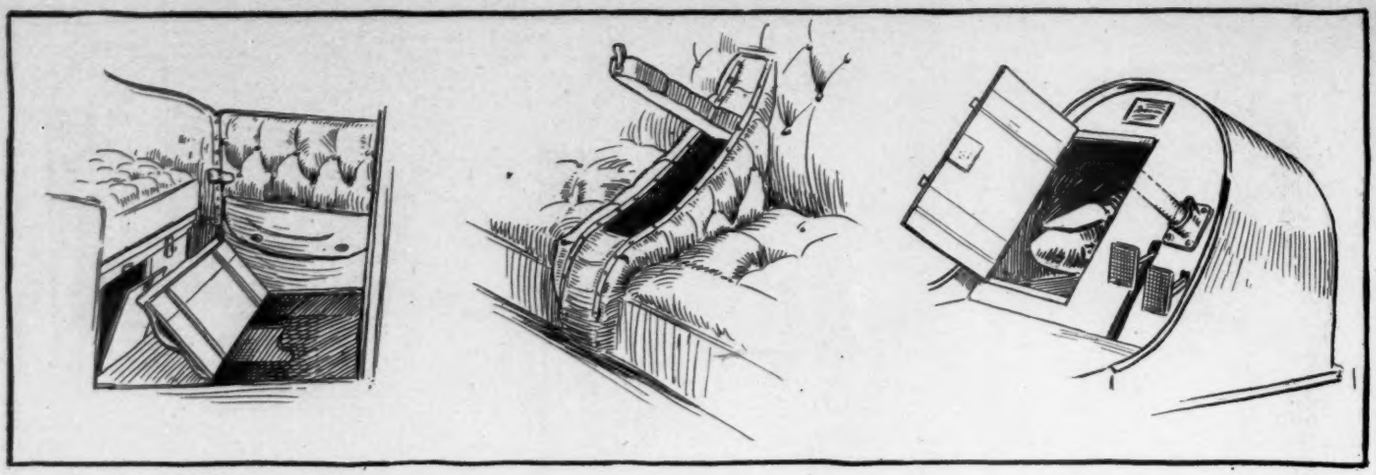
disks on the crankshaft continued, or on another shaft auxiliary in line with it and carrying friction wheel or wheels on a cross shaft, the friction wheel on this shaft contacting with the face of the friction disk and being slid across the face of the disk to give speed variations and the reverse movement. While all use this general layout, the method of attaining this end is different in all three machines. In the Cartercar a 20-inch disk of aluminum alloy is carried on a shaft running toward the rear from the flywheel and for convenience called the disk shaft. This disk shaft has the friction disk keyed and pinned on its rear end. The forward end of the shaft carries a three-arm spider with a bushed eye hole in each arm. On the flywheel surface are three long studs which fit in these bushings. A spring normally holds the disk and its shaft forward away from the friction wheel, but to engage a pedal action carries the disk and its shaft to the rear against the outer surface of the rim of the friction wheel, the studs on the flywheel being of sufficient length to allow of this. The friction face of the disk is a plane surface and the other face is stoutly reinforced with radial webbings which are used to resist spring of the disk when driving. The 20-inch diameter friction wheel has a paper contact rim 1⅝-inch wide. The wheel is feathered on a cross shaft, which is at each end, carried on American roller bearings, with the cages for these bearings supported in a ball and socket bracket from the side piece of the frame, this support giving enough leeway to avoid improper contact of the disk and wheel. The interesting point of this transmission is that the friction disk is moved backwards against the friction wheel, while the wheel with its cross shaft does not have to be carried on rocking bearings and is not rocked forward or back. In the Lambert cars the relation of the friction disk and friction wheel is the same as in the Cartercar, but the disk, also 20 inches in diameter, is faced with aluminum alloy ⅜-inch thick and held in place by a series of rivets with countersunk heads. The friction wheel, 18 inches in diameter, slides on its cross shaft for giving speed variations. Its friction surface is also of paper, but made 1½-inch wide. In engagement the cross shaft is rocked forward, while the friction disk on the continuation of the crankshaft remains stationary, not having any end movement. The rocking of the cross shaft to the front or rear is by bodily moving the shaft with its bearing brackets and is accomplished by a system of double swinging links at each end. As in the Cartercar, speed changes are by lever, but engagement is by pedal. The Simplicities' transmission is different—it has two friction disks and two friction wheels. The disks, 27 inches in diameter, are carried on a continuation of the crankshaft, one disk with its friction face towards the rear and the other opposite to it, with its friction face towards the front. Between these disks is the two-piece cross shaft, carrying a couple of friction wheels, one on the right side of the crankshaft continuation and the other on the left.

**Drive Employed in Three Cars**

Cross shafts are supported at their inner ends in a yoke spanning the disk shaft and are there supported in a ball and socket support. The outer ends of these shafts are carried in bearings which can be moved to the front or rear accordingly as the friction wheels are to contact with the forward or rear disk. The cross shafts are thus hinged at their inner ends and are free for a limited movement at their outer ends. When driving, if the friction wheel on the right side is in engagement with the forward disk, the friction wheel on the left side will contact with the rear disk and vice versa, this being imperative to drive both rear road wheels in the same direction. The disks are simultaneously moved on their shafts to give speed variations. For engagements the cross shafts swing towards the disks. In this transmission the disks are faced with mineral tanned leather and while they are of 27-inch diameter the friction wheels are only 17 inches in diameter, giving the cross shaft a slightly faster movement than where the wheels and disks are of the same diameter. In driving from the cross shaft the Cartercar uses a single chain, the Lambert side chains or



MOLINE TRANSMISSION SPRING | SIDE AND PLAN VIEW OF CRAIG-TOLEDO FRAME



STODDARD-DAYTON BAGGAGE SPACE AND FRONT SEAT TOOL BOX

FRONTENAC BAGGAGE COMPARTMENT

shaft and the Simplicities side chains. Before leaving the Simplicities car the novel motor support should be mentioned, consisting of a central tubular support at each side and a third support in the form of a bearing for the crankshaft at the rear of the crankcase. The side supports are on a tube carried at its end on the frame and passing through the top part of the crankcase to which it is secured.

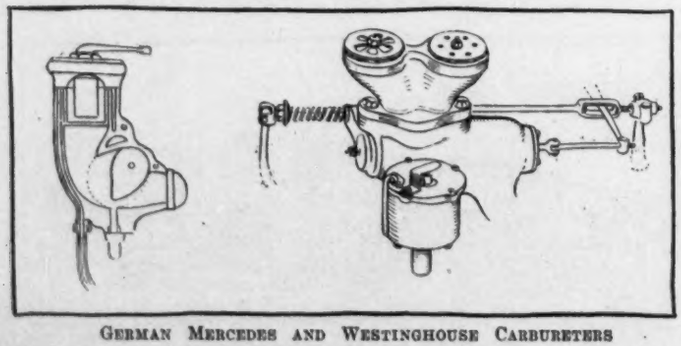
Unit power plants, while very attractive in the pleasure cars, have invaded the commercial sphere, one of them being the Atlas two-cycle two-cylinder truck in which the crankcase of the motor and the united clutch and gearbox housing are rigidly secured together. The disk clutch is in the front end of the gearbox, and this box is close to the motorcase, due to the placing of the flywheel in front of the crankcase. The driveshaft is encased and there is but one universal joint—that at the forward end of it, the rear end of the casing entering the front of the differential gear housing. Accessibility is featured in the case by having a separate cover for the clutch compartment, another cover for the gearbox, and a large cover for the upper and rear of the differential, it fitting onto the lower or main part of this housing at an angle of 45 degrees. Having the differential housing divided this way instead of vertically or horizontally retains the strength of the housing and makes it specially accessible, allowing of changing the gear ratio without disassembling the gears or even removing the differential.

**Two Frames in Craig-Toledo**

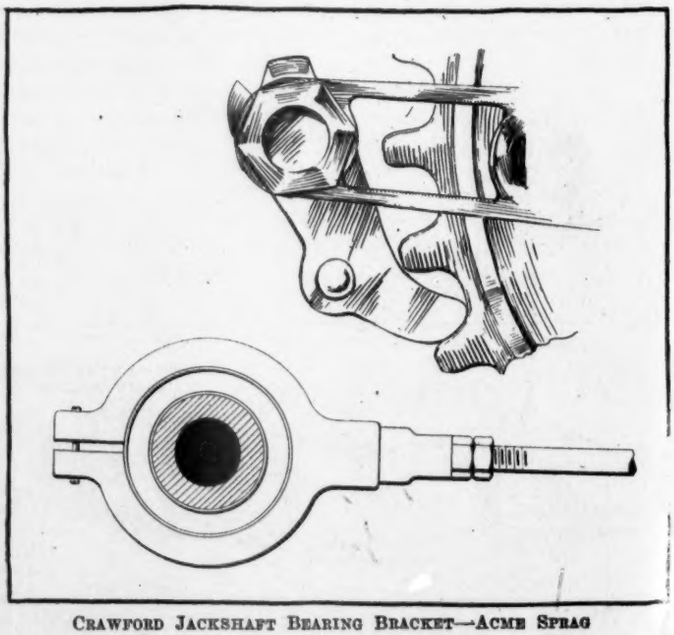
In its framework design the Craig-Toledo runabout uses a system resembling the Marmon at first glance, but showing marked differences after a cursory examination. Two frames are used—a main frame for carrying the car body and a sub frame on which all of the parts, like the motor, transmission and driveshaft housing, are carried. The main frame is a pressed steel rectangle supported in front on semi-elliptic springs and in the rear pivoted on the tops of full elliptic springs. The subframe pieces are hinged at their front end to a crosspiece of the main frame and extend to the rear parallel to a point back of the transmission case, whence they gradually converge to the rear end of the propeller shaft, at which point they are held together in a bracket surrounding the driveshaft housing and having a bearing on the neck of the differential housing in the back axle. There is not a universal joint in the entire system between the gearbox and the back axle, the whole being rigid with the subframe. As already stated, it is hinged at its front end. The shaft housing is supported near its forward end by a pair of brace rods secured to the outer ends of the axle housing, converging near the front of the shaft, where they attach to a bracket carried on a crosspiece of the subframe. Another concern using a triangular brace system like this is the Dragon. The driveshaft is encased with the front end of the case hinged to a crosspiece of the frame and stiffened by a triangular brace system from the ends of the back axle housing. Only one universal joint is used—at the forward end of the shaft and placed so its axle is in line with that of the trunnion carrying the forward end of the housing.

Among the many features of the Zust car is the use of a peculiar form of pet or priming cock in the cylinder heads. Instead of being of the regular type it is, in reality, a threaded needle valve, the top end of it with a crosspin for turning and the lower or valve end controlling the passage into the combustion chamber. Surrounding the valve is a medium-sized basin with a series of small openings leading from its bottom to the space around the valve point. In this car the transmission is featured by the use of two bevel pinions for driving to the differential, there being a bevel pinion on the end of the mainshaft of the gearset and one on the end of the countershaft, so that on top speed drive is direct and on all other speeds the drive is transmitted to the countershaft and then direct to the differential.

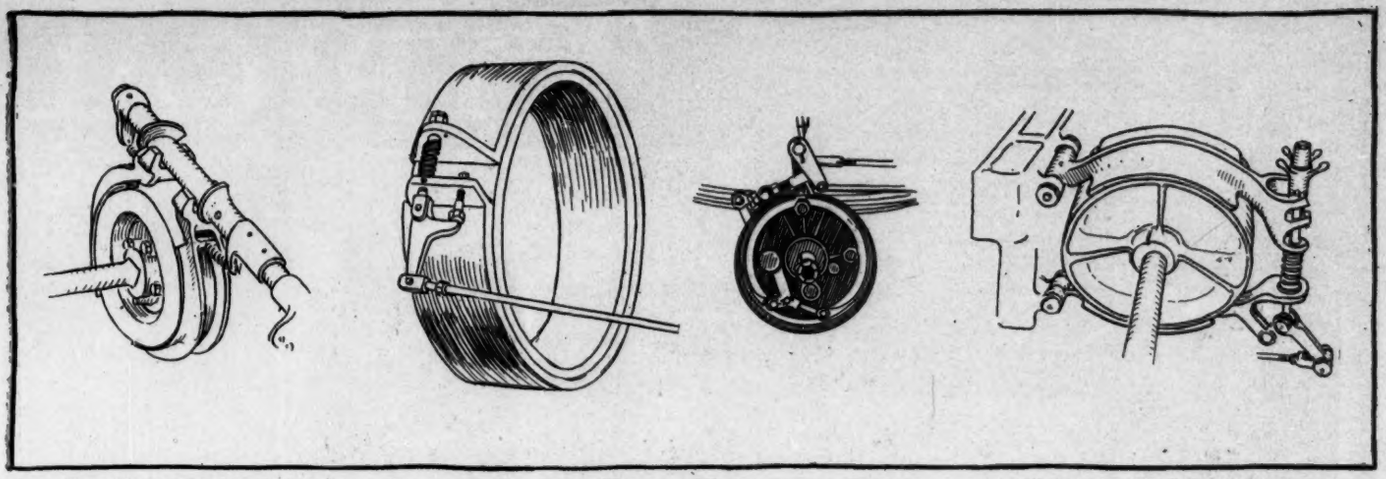
An airbrake effect is given in the cylinders of the Pilain car by using the laws in physics discovered by Mariott and Gay-Lussac—



GERMAN MERCEDES AND WESTINGHOUSE CARBURETERS



CRAWFORD JACKSHAFT BEARING BRACKET—ACME SPRAG



DELAHAYE TRANSMISSION BRAKE  DORRIS TRANSMISSION BRAKE  MOLINE DOUBLE BRAKE  WESTINGHOUSE JACKSHAFT BRAKE

that air doubles in compressibility over gas. The effect is gotten by adding a clear air port to the carbureter that starts to open when the gas is entirely throttled. In the manipulation of this combination a hand lever is placed in the top of the steering column. This lever rocks back and forth through half a circle. At its central, upright position the carbureter is closed to either passage. Moving it back opens the throttle, while moving it forward, from the central position, opens the clear air passage above mentioned.

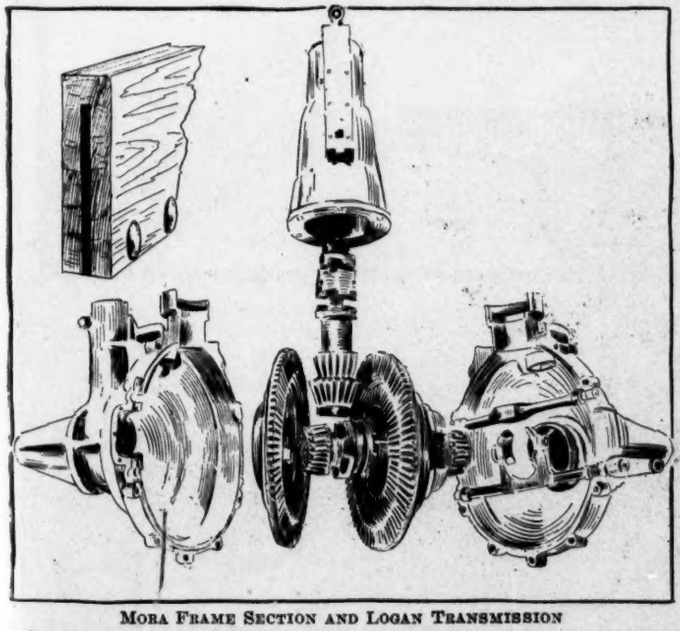
Another feature of the Pilain car is in connection with the selective gear change. There are three push rods running to the gearbox, operated through a three-slot gate quadrant. The first of these rods, from the right, is the reverse, and the second is the first and second speed. These are all of the general scheme of sliding gears. The third rod controls the third and fourth speeds, each being independent of the other and both a direct drive. To effect this there are two bevel pinions meshing with two bevel gears on the differential box. The third speed is the rearmost of the two, and its pinionshaft slides within the sleeveshaft of the fourth gear-pinion. Each becomes effective by a sliding two-ended jaw clutch.

The most striking novelty on the car is the method of drive from the gearbox to the rear wheels. The wheels are mounted on an I-beam axle. Encased along with the brakedrum is a spur gear on the inner side of each hub. Meshing with this is a spur pinion, connected—on both sides of the car, of course—with the gearbox cross-shaft by a short shaft running diagonally up and forward. This shaft is made in two parts, in its length, with butting flanges to connect these into one. On either end of these short shafts are ball and socket joints. By this method of drive a solid rear axle is possible and at the same time a flexible gear drive is given that is readily attended to in case of need, should the driving members become deranged in any manner.

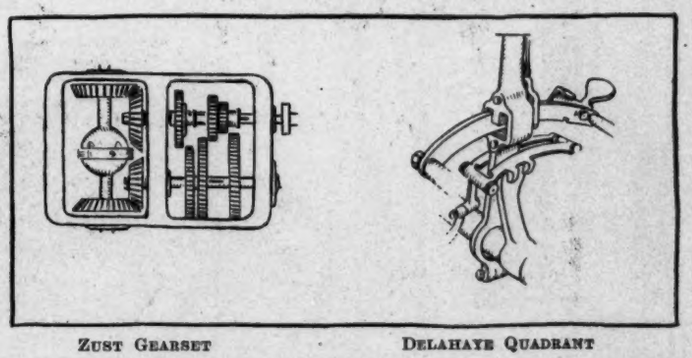
**Electric Gear Quadrant Popular**

The electric gear quadrant used on the Delahaye car is of the type now coming into use in this country where the operating shaft is not a sliding sleeve, there being used instead an inner and outer shaft, the outer being a tubular affair over the inner, each of which rocks back and forth. The quadrant in this instance is of the under-notched type familiar in the progressive sliding gear change. The hand lever is of the type pivoted at the bottom. Where the hand lever passes over the quadrant the eye is notably wide, to permit the side-rocking movement. Projecting down from this eye at its center is a tongue that prevents the side rock of the lever until this tongue is brought into line with a notch on the top side of the quadrant. When the hand lever is moved out or in—right or left—it comes into engagement with an open U-shaped jaw, on the top of an upwardly extending arm, there being one of these arms for each shaft. Moving the hand lever forward or backward locks that particular shaft, which is lever and link connected to the sliding gear set which it effects. This engagement of the hand lever is not direct with the two jaws, but through an interposed rocking plate slotted for the passage of the hand through to its hinged lower end. To those familiar with the Stoddard-Dayton gear change these rocking jaws will be well understood. From this point up there ceases to be a similarity, as the Stoddard-Dayton is much simpler in its detail.

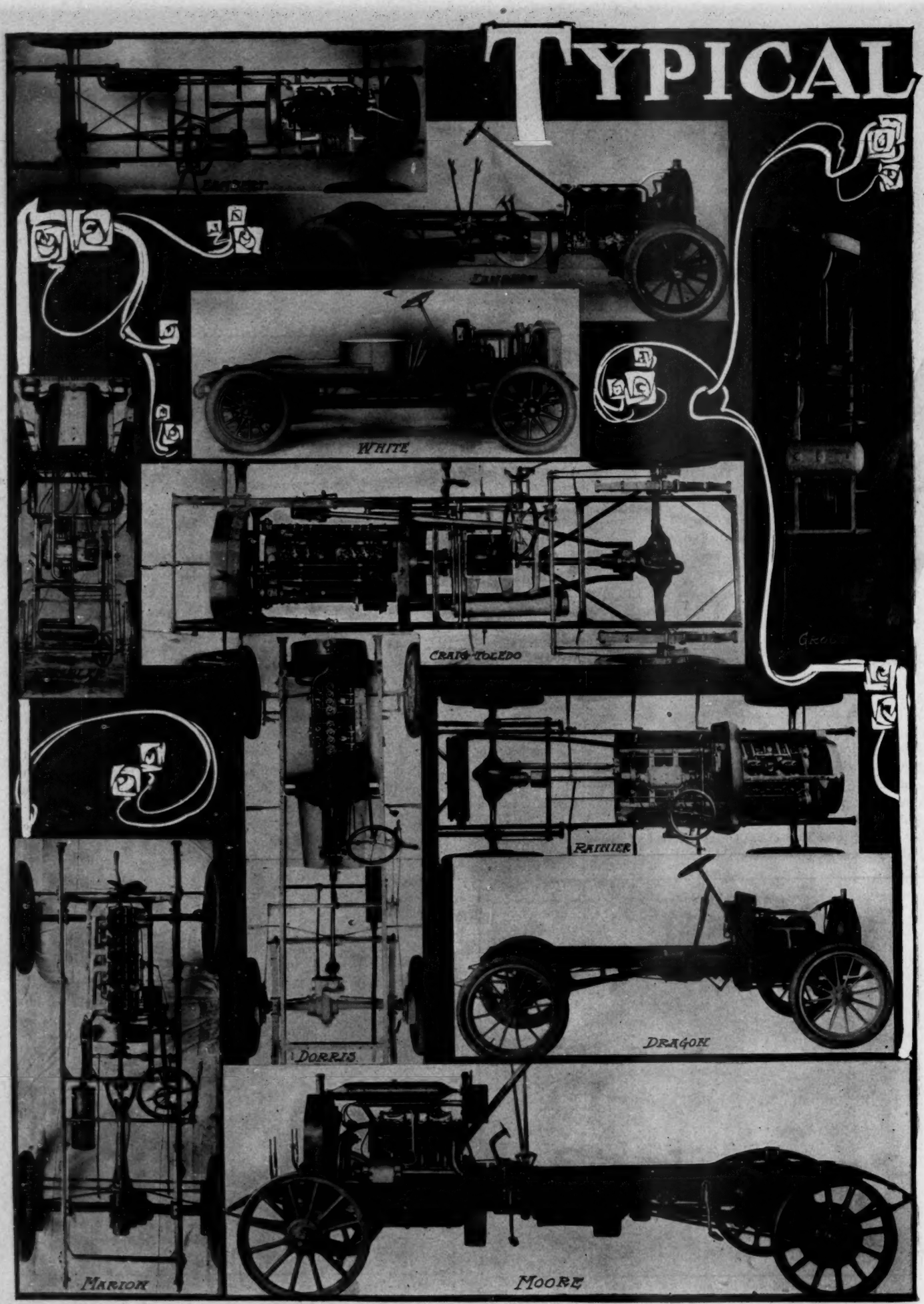
The question has been raised as to the loss sustained in transmitting power in this manner, but it is asserted that thorough and lengthy tests that have been conducted did not show an appreciable loss, and that, even if they had, the extra strength and simplicity of the mechanism in this method of final transmission more than made up for the loss sustained. Transmission design is probably receiving as much attention from motor car engineers as is any other part, and it would, indeed, be strange if ideal form were not evolved sooner or later. There is every reason to believe that in the near future rear road wheels will not be carried on the driving axle to any extent.

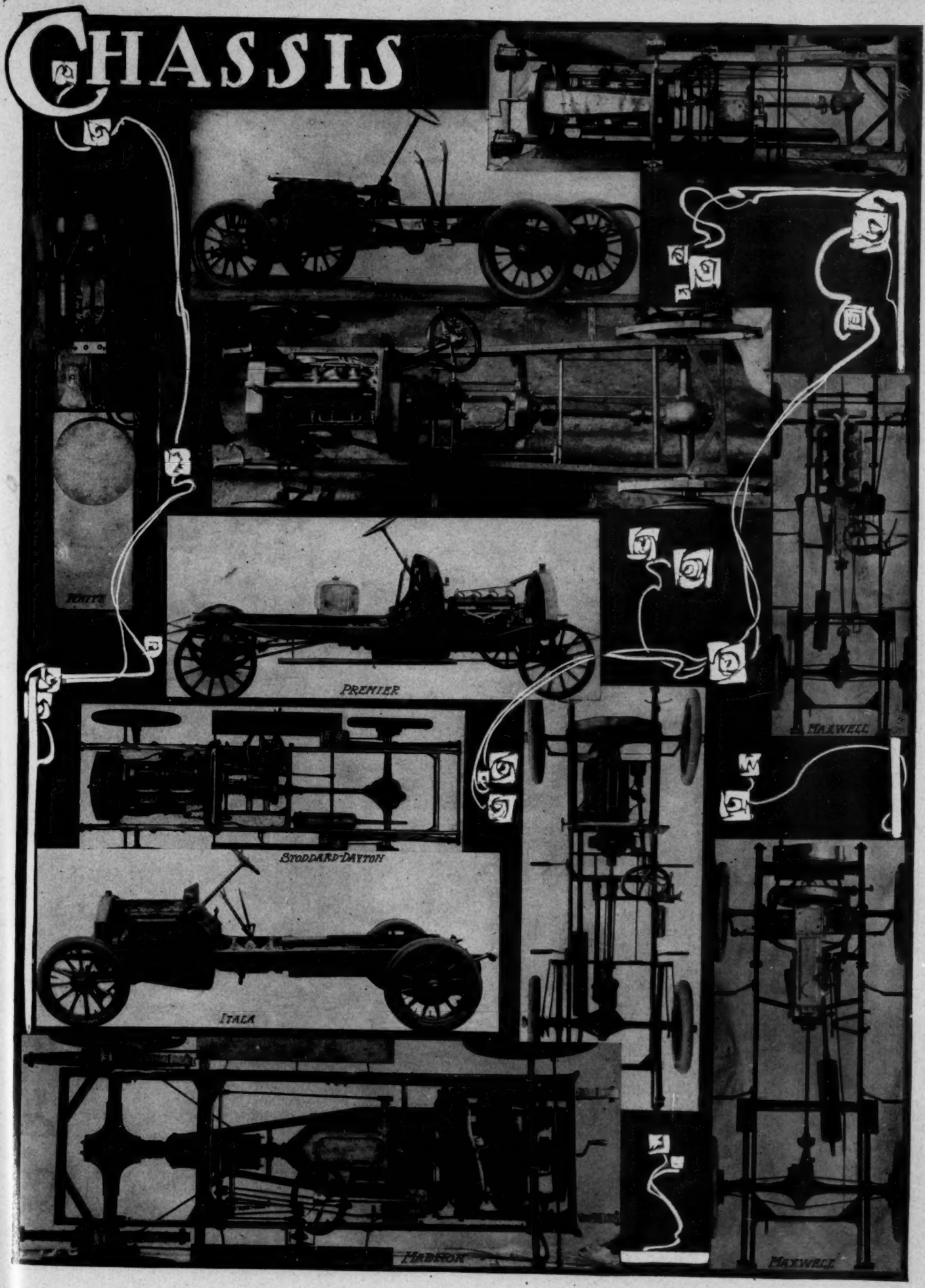


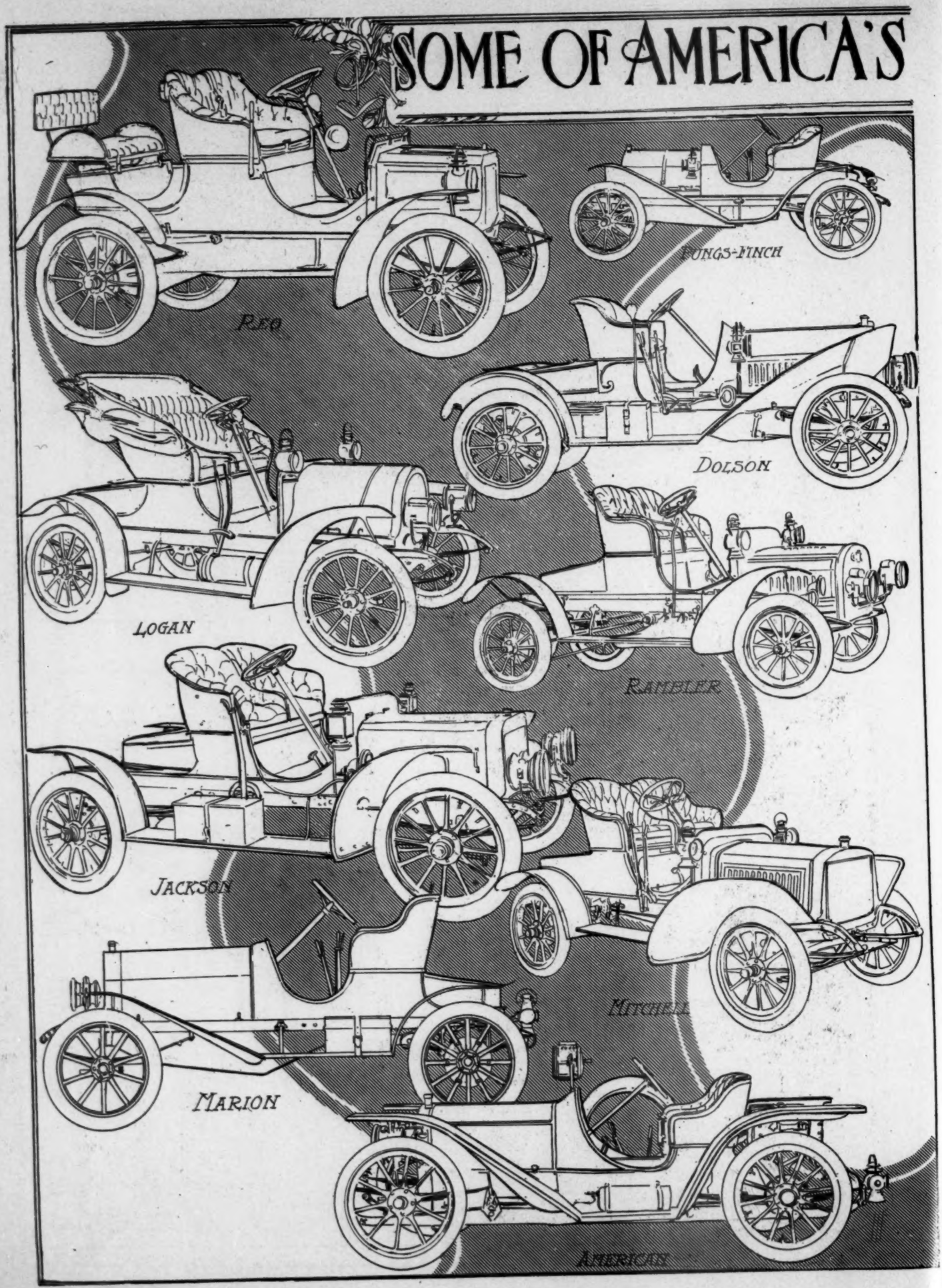
MORA FRAME SECTION AND LOGAN TRANSMISSION



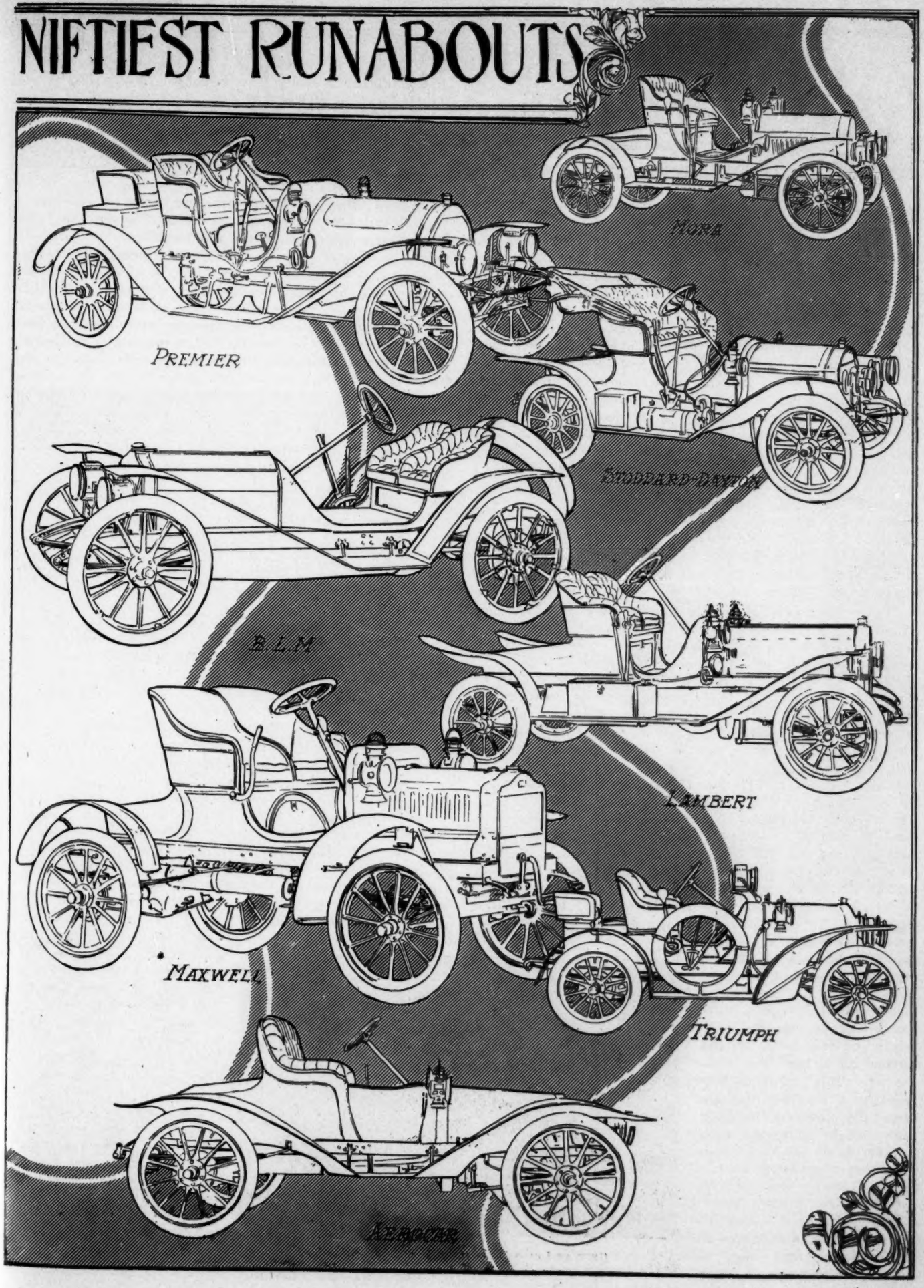
ZUST GEARSET  DELAHAYE QUADRANT


TYPICAL
WHITE
CRAIG-TOLEDO
RAINIER
DRAGON
DORRIS
MARION
MOORE


CHASSIS
WHITE
PREMIER
MAXWELL
STODDARD-DAYTON
ITALA
MARMON
MAXWELL


SOME OF AMERICA'S
REO
PUNGS-FINCH
DOLSON
LOGAN
RAMBLER
JACKSON
MITCHELL
MARION
AMERICAN

# NIFTIEST RUNABOUTS



ONE of the most notable of the innovations found at the show is the new system of regulation employed on the White steam cars. As all steam car users are aware, the system heretofore identified with the White cars has included thermostatic regulation of the fire. A copper and iron thermostat exposed to the temperature of the live steam just over the fire, acting on a valve controlling the fuel supply to the burner, the valve being opened by a contraction of the thermostat due to fall in the temperature of the steam. The flow of water to the generator was regulated by a bypass valve and diaphragm regulator acted on by the steam pressure, an increase in the pressure acting to open the bypass valve and stop the flow of water to the generator. In the new White system the thermostat is still employed, but in an entirely different capacity, since it now acts as one of two separate control devices to govern the flow of water to the generator, and the fire is governed by the steam pressure. Whenever the steam pressure is below 600 pounds, which is the normal working pressure, the fire is "on," and conversely whenever the pressure is above 600 pounds the fire is "off." In other words, the valve regulating the fire has much the same abruptness of action that an electric switch has.

To explain the system in detail without a diagram is a little difficult. The water from the tank passes through two connected pumps around which there is a bypass with a diaphragm regulator of the customary sort. This regulator is set to open the bypass valve when the steam pressure exceeds 600 pounds per square inch. Up to this point there is no change in the familiar White system except that involved in nearly doubling the working pressure. From the pumps the water passes through a heating coil above the fire, and beyond this it may enter the generator by one or both of two distinct paths—one path being through what the makers term a "flow-regulator." The construction of this regulator is not explained, but its function is to limit the flow of water to a certain definite rate per minute, irrespective of the speed of the pumps. Whatever water enters the regulator, beyond the definite amount which is permitted to pass the generator, is returned to the tank. The second path is arranged in shunt with the flow-regulator, and includes the thermostat valve. The action of the thermostat may be understood by considering that when the speed of the car increases beyond a certain limit the engine is insufficiently fed by the steam made from the water passing through the flow regulator. This attenuated steam will, therefore, be heated by the fire to a temperature above the normal, and the resulting expansion of the thermostat opens a valve, permitting a supplementary supply of water to enter the generator from the feed water heater. This valve is large enough to send the full flow from the pumps to the generator, thereby giving the engine all the steam it can consume. The almost immediate result is a rapid increase in steam pressure above the working limit of 600 pounds, which causes the diaphragm regulator to open the bypass valve and stop the water feed altogether till the pressure drops to the normal, when the bypass valve will close and water will again enter the generator through the flow regulator. The valve controlling the fire is governed by the water pressure in the flow regulator. It is not open unless there is a certain minimum pressure in the flow regulator, and when this pressure ceases by the opening of the bypass valve the fire shuts off. At all other times the fire is open. For the purpose of firing up, a hand valve is provided which sends enough gasoline to the burner to raise pressure sufficient to enable the engine—disconnected from the rear wheels—to run the pumps, which action opens the main burner by raising sufficient water pressure.

ONCE AT LEAST WHERE THE HORSE IS DISPLACED

The generator is similar to that used in previous models, but of greater capacity. The new White steamers will be made in two models, one of which is similar to that of last year, but has the new system of regulation, while the second is rated at 30 horsepower. The construction of the running gear and the transmission is substantially the same as heretofore.

Turning to the gasoline cars, an interesting new carbureter is seen on the Mercedes and the American Mercedes. It is intended to give a constant velocity to the air stream passing the spray nozzle for any conditions of running. This is accomplished by forming the air passage in the shape of a tapering slot in the periphery of a pivoted bronze segment, which rotates through an arc so that when set in one position the small end of the slot is over the spray nozzle, thereby giving sufficient suction when the engine is running slowly, while for high speed conditions the segment is rotated to bring the large end of the slot over the spray nozzle, thus giving a more ample passage for the air, and avoiding the extreme increase in velocity which would produce an over-rich mixture. The periphery of this segment rotates against a stationary curved surface which completes the passage surrounding the spray nozzle. In order to make the carbureter automatic this segment is balanced and oscillates of itself under the influence of the air suction.

Another carbureter which is not strictly new abroad, although new in this country, is the Xenia. In this carbureter, which is found on the B. L. M. Pirate runabout, the opening of the main air intake is governed automatically by a hard rubber float working in a mercury dashpot, the float being depressed to increase the opening as the suction increases. For this purpose the float is connected to a piston working in a small cylinder above the spray nozzle, the bottom of the piston communicating with the spray chamber and the top with the outer air. The same float controls a sleeve which works over the gasoline standpipe, in which are seven pairs of small lateral holes, which are uncovered one after the other by the sleeve as the float is depressed. This makes it possible to spray the gasoline from small apertures at low speeds, thereby getting a fine spray and a good mixture, and still to have sufficient opening for high speeds without having so much opening as to make an over-rich mixture. The result of this is to give a very

sensitive and flexible action at low speeds without restricting the efficiency at high speeds.

A somewhat novel arrangement of valve operating mechanism is found on the new Frayer-Miller car. The inlet and exhaust valves open laterally, as before, into opposite sides of a combustion chamber projecting above the cylinder head, and are operated by bell cranks and push-rods from the cams. Instead, however, of having two camshafts as before, only one is employed, this being located on the left side of the motor. The inlet valves are worked by push-rods which run slantwise from the camshaft across and upward between the cylinders to bell cranks suitably disposed. The camshaft, instead of being housed in the crankcase, is wholly outside, and the cams, etc., are covered by bronze caps. This makes it very easy to dismount the shaft. The increase in cylinder sizes of this motor to 5½ inches bore by 5⅛ inches stroke is interesting, as showing the possibilities of the Frayer-Miller system of cooling cylinders by a forced blast of air. Two ignition systems are used, one by high tension magneto, and the other by battery and spark coil, and the plugs are located outside of the bus pipe, instead of in it, as before, for the sake of greater accessibility.

an exception in the use of reinforced wood; the side members are of oak, approximately 2 inches wide by 5 inches deep, and are slotted vertically from beneath for about 3½ inches to receive a stiffening steel plate. Another interesting feature of this car is the use of a rigid pan of cast aluminum under the motor flywheel and gearbox. This pan, although it does not serve exactly as a frame member, nevertheless is sufficiently rigid to support the motor, gearbox and such accessories as the circulating pump, as well as the pedals and sundry other control members, thus making it unnecessary to form special brackets on the crankcase and frame in order to carry these necessary members.

A neat detail noticed on the Rainier, which is not greatly changed from last season, is the use of a light aluminum cover over the make-and-break igniters on these cylinders. As the cylinders are cast in pairs two covers are used, one for each pair of cylinders. These covers have oil holes through which the igniters may be oiled, and in common with the practice at other small oiling points on the Rainier cars, they are fitted with dustcaps at each oil hole.

A neat little detail noticed on the Pierce-Racine is in the form of the connections from the secondary cables to the direct plugs.

A novel arrangement of chassis is seen in the American roadster, which is a touring runabout of 30 horsepower. The frame, instead of resting on its springs above the axles, is suspended below the axle, bringing it, of course, very near to the ground. The effect of this is greater than might at first appear, since it gives an unlimited upward play to the springs and axles. In order to support the motor and gear box properly a raised false frame is employed. Underneath the main frame is what amounts to a continuous flat pan from front to rear of the car. Even the flywheel clears this pan, and the result is a perfectly smooth run underneath the car, which should be most effective in preventing dust raising. The seats are rather low, and the toeboard has a steep slope. The sides of the car are panelled. From the bottom of the frame to the footboard is a distance of 10 inches or thereabouts. The mechanical arrangements, however, are not so much out of the ordinary as might be expected, and the transmission is of the conventional sort by sliding gears, propeller shaft and live rear axle to the road wheels.

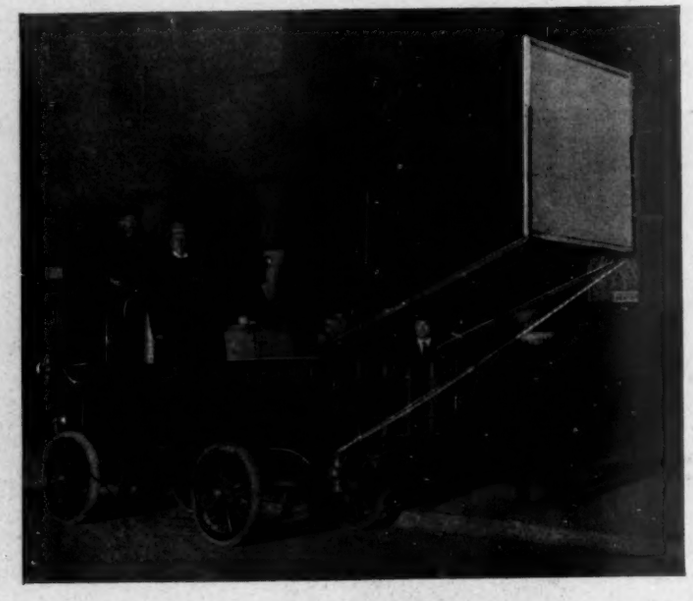
In frame construction nearly everything seems to be pressed steel, for the most part in channel section, but the Mora presents

These take the form of hard rubber caps enclosing spring clips which are pushed over vertical stems on the spark plug heads. The rubber cap has a hole in its side into which the end of the cable is inserted with the wires exposed and scraped for about ⅜ inch. A brass bushing containing the spring clip is screwed into the under side of the rubber cap till it jams against the wire of the cable, thus locking the latter and making good electrical contact at the same time. The caps, of course, can be readily disconnected without fear of a shock when testing the motor.

Notwithstanding the almost universal use of pressed channel section steel in frame construction, most designers rather incline toward the steel-armored wood frame as being ideal for the purpose, notwithstanding the fact that it increases the weight of a car a little and costs more than steel. The inability to procure good wood and the slowness in production, to say nothing of the extra cost of production, probably are good and sufficient reasons why it is not found in more general use. The use of wood for frame construction even in commercial motor vehicles is by no means so general as it was a year or so ago, steel having taken its place with most manufacturers.

In the new Duryea motor, with 5 by 5-inch cylinders, a rotary valve is used which is run from the crankshaft by a silent chain. This valve gives very direct openings for the inlet and exhaust, and is located so as to receive whatever surplus oil may be expelled from the cylinder with the exhaust. Mr. Duryea stated he had used it with success for a season before putting it publicly on the market. In these motors a very simple form of contact igniter has been adopted, but at the option of the purchaser the Orswell jump spark ignition system may be substituted. In this system the induction coil is mounted directly on the cylinder head, so that the secondary wiring is entirely suppressed. The trembler and condenser are separately contained in a case, which may be located wherever convenient.

An unusual number of special features are found in the Moore car, which already has been described at length in the trade press. This car is called by its makers "the ball bearing car," and this describes its most striking characteristics. Ball bearings are employed not only in the wheels, live axle and gearcase, but in the engine even to the bearings of the camshaft and likewise in the cardan joints of the propellershaft, and in the rollers of the clutch-releasing fork. The clutch has a double metal-to-metal cone, and is small enough in diameter to go into an enlarged hub in the flywheel. It appears to be lighter than a multiple disk clutch of the same capacity. A feature of the bearings in the gearbox, which is not found in all cars, is that the ball bearings are set into pockets and are completely enclosed from the gritty oil in the case, as well as from external dirt which might otherwise creep in. The pockets are large enough to let a ball accidentally broken to drop out. The two camshafts, one on each side of the motor, are driven by spiral gears from a transverse shaft, which is itself driven from the crankshaft in the same manner. The same transverse shaft drives also two Lacoste magnetos, one at each end. These magnetos deliver currents simultaneously to separate sets of spark plugs, one over the inlet valves and one in the center of the cylinder heads, and the ignition is advanced and retarded automatically by a governor at one end of the cross shaft, which shifts the spiral gears driving the magnetos. The built-up crankshaft of this motor is already familiar from illustrations. It runs in five very large ball bearings, which look as if they ought to outlast everything else on the car.



MAXWELL TRUCK AS MOVING PICTURE MACHINE

Another car in which ball bearings are freely used is the Berkshire, whose 1907 model employs ball bearings throughout the transmission and in the engine. The transmission of this car is of individual clutch type with the gears already in mesh. The system is peculiar to this car, and comprises a set of four pairs of gears with expanding metal-to-metal clutches inside the driven gears. The shaft carrying these gears is hollow and a rod running through it carries spreading fingers working through slots in the shaft to act upon the clutches.

A neat detail seen in the Stoddard-Dayton car is an arrangement by which the footbrake can be arranged to release the clutch or not as the operator prefers. It consists simply of an adjustable screw connected to the footbrake pedal in such a manner as to push against the pedal when adjusted for that purpose. When screwed backward to the limit of its motion it leaves the clutch pedal free.

A feature of the Zust car is the very large quadruple worm at the base of the steering column. This worm is formed in one piece with the lower end of the steering shaft and is evidently intended to last as long as the car without adjustment. The ignition on this car is by Simms-Bosch low-tension magneto, and the ignition current is carried to a series of push buttons in a fiber mounting on top of the engine, by which any cylinder may be cut out for testing.

The influence of a well known Indianapolis car is plainly seen in the frame construction of the car put out by the Craig-Toledo people, whose engine and gearbox are carried on a triangular frame having its front end swivelled to the main frame and its tapering rear end swivelled to the rear axle on an axis coincident with that of the bevel pinionshaft. The crankshaft, gearshaft and propeller shaft are all in line with the bevel pinionshaft. This car has a multiple disk clutch with a large number of disks and has made an impression on the critics at the show.

# MAY SELECT NEW YORKERS—SMOKER FOR TRADESMEN

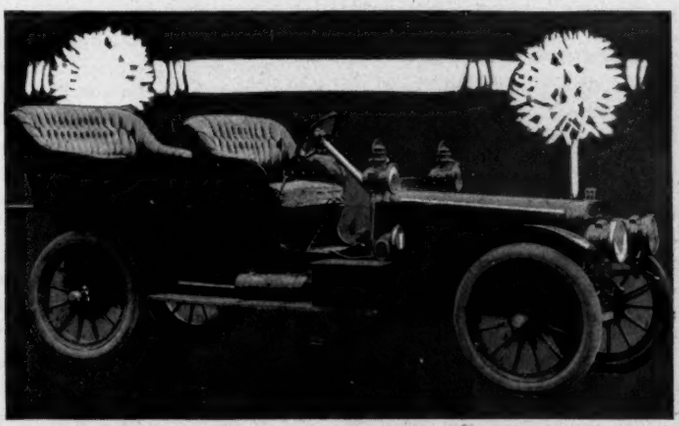
New York, Dec. 4—Special telegram—Judge W. H. Hotchkiss, of Buffalo, will probably be the next president of the American Automobile Association; Fred Elliott, of Syracuse, the next secretary, and George E. Farrington, of Orange, N. J., treasurer. A regular directors' meeting was held at the Grand Central palace this evening. Chairman Jefferson De Mont Thompson, of the racing board , handed the treasurer a check for $10,000 as a part of the proceeds from the last Vanderbilt race, and he will make a final report later. The annual meeting and election will be held in New York January 17. A. R. Pardington, A. G. Batchelder and George E. Farrington were appointed as a nominating committee. A convention will be held in Chicago during the show there. The by-laws were amended so that state associations will pay to the national body only 25 cents for each member and $5 initiation for the club instead of dividing fees and dues as heretofore. The Quaker City Motor Club, of Philadelphia; the Tidewater Automobile Club, of Norfolk, Va.; the Automobile Club of Union County, of Plainfield, N. J.; the Maryland Motor Association, of Baltimore, and sixty individuals were admitted to membership in the national organization, the A. A. A.

New York, Dec 3—Special telegram—During the daylight hours on Saturday everyone was busy at the show or seeing the town. Sunday night there was no early sleep for the tradesmen and others out of town, for they were rounded up to attend the smoker of the New York Motor Club. This was the event of Sunday, especially prepared for visitors. They attended it 600 or 700 strong and had a time which drove away all business cares and convinved them that the lid is not quite all the way down.

It was the best function of the sort ever arranged by the young club and the way it was carried off proved the organization to be a live wire with a big flow of current. Professional talent had been engaged and there were songs, dances, monologues and comedy skits, some of which were spiced sharply enough to suit the toughest palates. There were cigars, salads and drinkables in lavish quantities. The smoker was in the theater hall over the club rooms at Reisenweber's. President W. J. P. Moore was master of ceremonies, A. R. Pardington, upon request, gave a talk about the Long Island motor parkway. He said the project presents a problem new to engineers because it is to be a highway exclusively for pneumatic tires.

**Ford Motor Co.—Ford**

Henry Ford is well satisfied with his 40-horsepower six-cylinder model and the 15-horsepower four-cylinder runabout and he is content to present them for the consideration of the 1907 buyers. He has not attempted to make any material changes in chassis design in either car, but in the runabout, model N, he has substituted nickel steel for frames, shafts and gears instead of high carbon commercial steel. When Mr. Ford first started turning out the runabout he found it impossible to get special steels in sufficient quantities to meet orders, so he used the commercial steel. In looking over the big car he came to the conclusion that few changes were needed — principally refinements. So he has increased the power of the motor about 20 per cent and is using chrome nickel steel for the frame as well as for all gears, connecting rods, crankshafts, camshafts and other working parts. It also is noticed that he is grinding all cylinders as well as pistons, pistonrods and rings, crankshaft and camshaft bearings and other engine parts. There also is higher compression, while to compensate for this the radiator capacity has been increased 25 per cent. Another change noted is the substitution of a gear-driven centrifugal pump for the gear pump used this year. Six inches have been added to the frame and the wheel base increased to 120 inches. This, of course, means a heavier frame and the one fitted to the 1907 six is reinforced by trussing, as heretofore. To relieve the shaft of strains a flexible joint has been interposed between the motor and the transmission. The double ignition system has been retained. Ford has given up the semi-victoria type of body and instead is using the round corner tonneau form, with straight side lines, which gives more leg room and passengers now can face directly front instead of having to sit half-sideways. He has made the side doors very wide and seven can be carried by adding two extra seats or folding chairs. The fenders are enclosed and the sides of the car are enclosed for the full length by a concave metal raiser joining the running board to the body sill. The old rear axle remains, but the front one now is a one-piece nickel steel forging of I-beam section. Hubs are stronger and heavier. The model N specifications show a four-cylinder four-cycle vertical motor rated at 15 horsepower, with the cylinders cast in pairs and the water-jackets and valve chambers cast integral. The motor is placed longitudinally under a hood in the front. The valves are all on the left side, with the inlet and exhaust offset. They are interchangeable and are operated by a single camshaft. The camshaft is a one-piece nickel steel forging, with the eight cams integral and all bearing surfaces hardened and ground. The crankshaft is set at 180 degrees and the drop forgings, made from chrome nickel steel, are specially treated by the Wyman and Gordon processes. The crankcase is of nickel aluminum, with the side plates removable for inspection or adjustment of the bearings. There is a cellular radiator and a Splitdorf quadruple coil, Lacoste commutator and two sets of dry cells furnish the ignition. The fan is cast in the flywheel and a Ford float feed carbureter is fitted. Force feed lubrication is employed on this little four-cylinder runabout, there is a multiple disk clutch and the transmission is planetary.



FORD SIX-CYLINDER CAR EXHIBITED IN NEW YORK

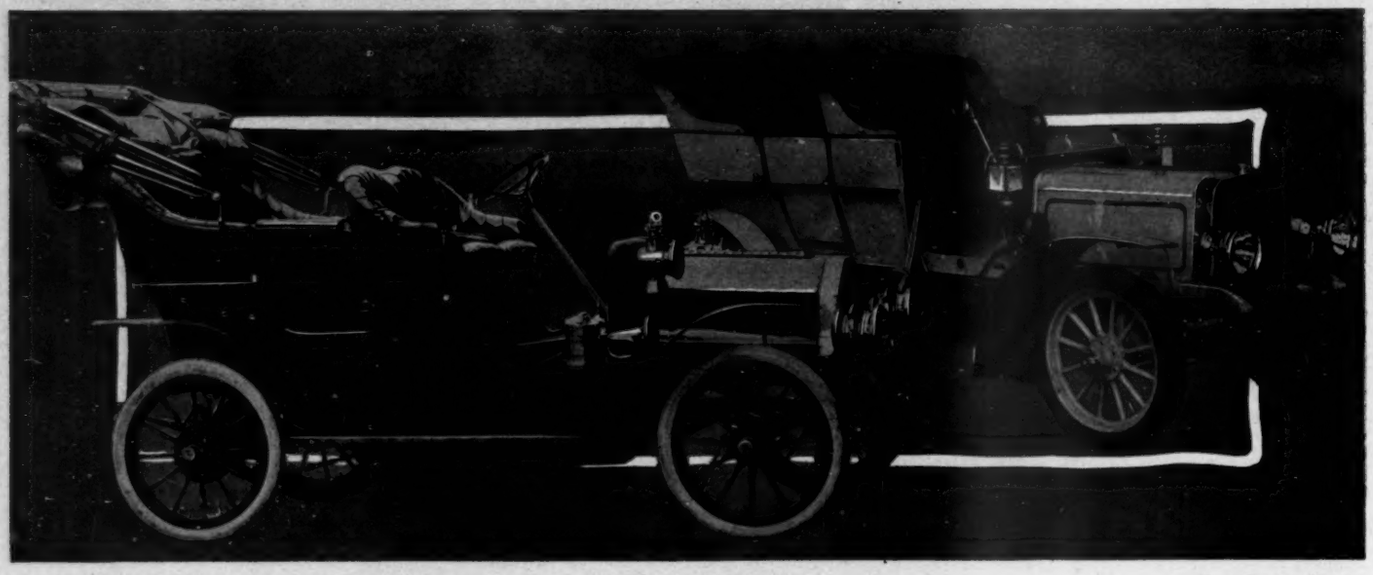
**Triumph Motor Car Co.—Triumph**

Chicago is the home of one of the latest additions to the high-powered runabout class, now growing so rapidly, its addition being the Triumph roadster carrying a four-cylinder self-starting water-cooled motor with a rating of 30 horsepower, having 4¼ by 5-inch cylinders cast in pairs and with integral waterjackets. Intake and exhaust valves are on one side actuated from a single camshaft. The self-starting feature comprises an air tank carried on the chassis in which air is maintained at high pressure from the third cylinder of the motor. From the top of the combustion chamber of this cylinder a pipe leads to a chamber resembling a carbureter located beside the two forward cylinders. From this carbureter-like casing is another pipe connecting with the air tank already mentioned. In this carbureter-like casing is a valve arrangement so that when starting the camshaft is shifted to bring into action a set of false cams; the intake valves on the two front cylinders and the exhaust valves on the two rear cylinders are opened, and at the same time one of the valves in the carbureter-like casing is opened, allowing compressed air from the chassis tank rushing, with a pressure of 80 pounds to the square inch, into the front cylinders. At the same time a valve in the piping from the carbureter to the two front cylinders is closed, preventing back pressure from the air tank into the carbureter. Simultaneous mixture from the carbureter is allowed to enter the back pair of cylinders. Thus when the pressed air starts the crankshaft revolving, mixture is sucked into the back pair and the motor immediately started, after which the pressure from the tank to the front cylinders is cut off and the connection with the carbureter established. All of this is done by a pedal. The pressure in the gas tank is caused by the pressure within the top of the third cylinder. Apart from its novel motor the Triumph combines in its make-up a metal-to-metal multiple disk clutch, a three-speed forward selective transmission and shaft drive to the rear live axle, which transfers power to the wheels through clutched hubs. Ignition is by a Wilson magneto supplemented by battery; a Hill oiler supplies the lubricant to the motor; a whirling spray float-feed carbureter of Triumph design furnishes the mixture; cooling is by a Long

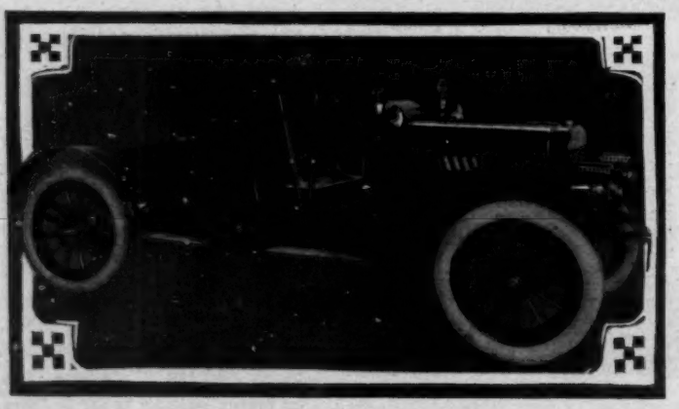
radiator, assisted by gear-driven pump; and in the running gear such points as 5-beam front axle, pressed steel frame with sub-frame, 36 by 3½ and 4-inch tires, 108-inch wheelbase, 54-inch tread, 40 and 55-inch springs, internal and expanding brakes on the rear hubs and spark and throttle control on a stationary quadrant on the steering wheel are met with.

**Deere-Clark Motor Car Co.—Deere-Clark**

In the pleasure car line this company exhibits for the first time in New York its touring car and runabout, both fitted with identical power plants but differing in body lines as well as seating capacity. The engine used follows standard lines with its vertical four cylinders as separate castings, each with a bore and stroke of 4 and 5 inches and valves carried on opposite sides and opened by direct lift. The inlet and exhaust passages are brought out and turned downward so the flanges to which the pipes are attached are horizontal. In supporting the motor a three-point suspension is introduced; the bottom of the case being held by pivoted bolts working in slotted lugs so it may be slung down from one side or fully removed as need be. The pistons are made with flat tops machined all over and carry three compression rings as well as oil grooves at the bottom and center. Other motor features are hardened hollow wrist pin, I-section connecting rods, bronze bushings at the piston end and babbitt at the crankshaft end. The crankshaft itself is cut from a solid billet of steel with bearings from 1½ to 1¾ inches in diameter and from 2¼ to 3½ inches in length. Ignition is by jump spark with plugs in the center of the cylinder heads. The current is taken from storage cells through a Kingston coil and delivered to the plug by a Lacoste timer. Cooling is by the use of integral waterjackets, Briscoe flat-tube radiator, water pump and fan. Flexible connection with the transmission is through a three-plate clutch. Two of the plates are cast iron attached to the flywheel and interposing is a cast steel disk connected with the change speed shaft. In obtaining the different changes in speed a combination clutch gearset is used in which the gears are always in mesh and the changes made on the selective principle in that the driver can drop from direct drive to slow speed or reverse without passing through intermediate. This is accomplished by a system of double clutches, operated by two sliding bars, the system not requiring the gate quadrant for the change speed lever. Drive from the transmission is by cardan shaft with universal joints and the back axle is supported on Timken bearings. In the running gear such typical construction as cast steel frame work with straight side pieces and sub-frame for carrying power plant; double brakes acting on hubs on the rear wheels; spark and throttle control carried on a stationary quadrant above the steering wheel; semi-elliptic springs in front and scroll head full-elliptics in rear; steering through a spiral gear combination; 106-inch wheelbase, 32 by 4 inch wheels, and I-section front axle with Elliott steering, are encountered. The body is of the straight line variety with small fenders and long running board.



REO TOURING CAR — TWO WESTERN PRODUCTIONS — THE DEERE-CLARK



RUNABOUT FROM THE ST. LOUIS LINE

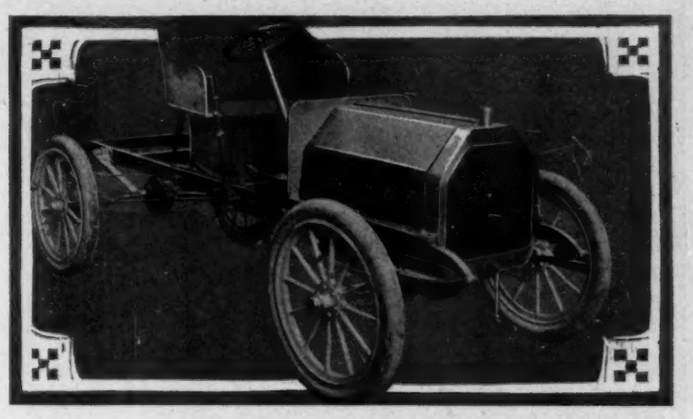
**Reo Motor Car Co—Reo**

A 16-20 horsepower, five-passenger touring car, the 8-horsepower runabout, a polished chassis of the 16-horsepower car and a limousine comprise the Reo exhibit. The runabout remains unaltered but in the touring car a few notable changes have been introduced. In the motor the camshaft is so designed that it can be removed without disturbing other parts of the motor. Provision is made for encasing the chain and sprocket on the rear axle with a fiber housing protecting them from mud and dirt, yet leaving the oiling of this part of the car as accessible as formerly. Six inches have been added to the wheelbase, making that measurement now 94 inches; the chassis has been dropped 2½ inches; changes in the tonneau result in making it 2 inches wider, with 3½ inches more foot room; and the use of a concave dash results in 1½ inches more space for the footboard. The planetary transmission has been redesigned, making it quieter in operation and a multiple disk clutch has been incorporated with it. The steering gear is now of the worm and segment type and the gasoline capacity has been increased from 9 to 12 gallons. Roller-bearing axles are used in front and rear axles. The ratio of the sprockets for the single-chain drive is now twelve to forty-two, these being that number of teeth, respectively, in the sprocket, on the transmission shaft and rear axle. The horsepower rating is placed at 16 to 20, the bore and stroke being 4¾ and 6-inch respectively. In the running gear

the pressed steel framework remains, being supported in front by half-elliptics and the rear by full elliptic springs, these in turn attached to their respective axles the same as formerly. The runabout has 78-inch wheelbase, 28-inch wheels, single-cylinder motor and single-chain drive, coupled with a planetary gearset incorporating a multiple disk clutch.

**St. Louis Motor Car Co.—St. Louis**

The introduction of a 45-50-horsepower machine of the seven-passenger class is perhaps the attractive feature exhibited by this concern. The motor evidences several changes in design, chief among them being the placing of the intake valves on one side and the exhausts on the other, this disposition necessitating the use of two camshafts from which the valves are opened by vertical lifter rods. The center line of the cylinder bore is placed ¾ inch out of line with the center of the crankshaft. The cylinders are cast in pairs with integral waterjackets and the bore and stroke are 4½ and 5½ inches respectively, while the compression is placed at 75 pounds per square inch. In supporting the motor on the car, a sub-frame has not been required, the motor arms extending laterally and resting on the channel side pieces of the main frame. Mixture is furnished by an automatic carbureter; ignition is by jump spark with current from storage cells; lubrication is by forced feed type, the flow maintained by a gear-driven oiler; a governor is not used; and motor control rests with spark and throttle levers on the steering wheel. In transmitting the first element is what is termed a single disk clutch with fiber inserts, the fiber easing engagement. Succeeding this is a selective form of sliding transmission, new with this concern, giving three forward speeds and one for reversing. Final drive is by shaft through bevel gear differential and live rear axle. The bearing problem has been coped with by the use of plain bearings in the motor and the general use of Timken rollers in other cases. A change noted in the brake system over previous models brought out by this concern is the use of internal and external brakes on the rear hubs, one set for emergency use applied by lever and the other for regular service brought into use by pedal. For cooling the motor a honeycomb radiator has been installed assisted by a fan and gear-driven rotary pump. The running gear incorporates such features as 112-inch wheel base, 4 inches longer than any previous model, and 34 by 4½-inch tires. The car is for five to seven passenger service and weighs 2,500 pounds. The other two St. Louis models are a two-passenger runabout and the five-passenger touring car, both of which are very similar to the present St. Louis machines in that the 30-35-horsepower motor is retained with its intake and exhaust valves carried on one side and operated by direct lift from the same camshaft. The runabout is made with 108-inch wheelbase and 32 by 4-inch tires, while the five-passenger car has the same measurements. In both of these models a tubular radiator is used, as is a type of straight sliding gear transmission, giving three forward speeds and one for reverse. On these models the brake system includes a couple of internal expanding members acting within drums on the back wheels and a regular brake band clamping on a drum at the rear of the transmission.

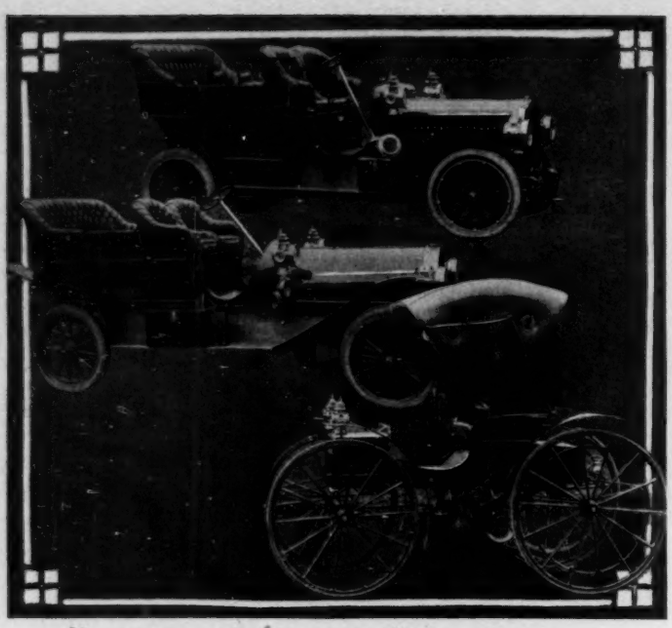


RAKISH LOOKING DRAGON RUNABOUT

**Dragon Automobile Co.—Dragon**

The present fall added one more name to the list of medium-priced four-cylinder cars, this being the Dragon, a 26-horsepower machine with a motor of very attractive lines, having four vertical cylinders cast in pairs, each having a bore and stroke of 4 and 4½ inches and with integral valve ports on opposite sides, intakes on the right and exhausts on the left. The valve opening calls for a couple of camshafts, both of which are enclosed in box-like chambers on the top of the crankcase and each shaft accessible through two large side plates, one opposite the part carrying the cams for the front cylinders and the other similarly located with respect to the rear cylinders. Through these openings, cams which are pinned and keyed to the shaft and carry hardened rollers can be examined. The crankcase is a three-part aluminum housing with a housing on the front enclosing the half-time gears and also enclosing on the left another gear driving a shaft, on the rear of which is the centrifugal watering pump located opposite the space between the cylinder pairs and the commutator on the front end immediately forward of the case enclosing the gears. In the water circulation is noted the prominence of large plates forming the tops of

WESTINGHOUSE LIMOUSINE A PAIR OF FRENCHMEN MORS, WITH SELF-STARTING DEVICE



LAMBERT G AND H — HOLSMAN RUNABOUT

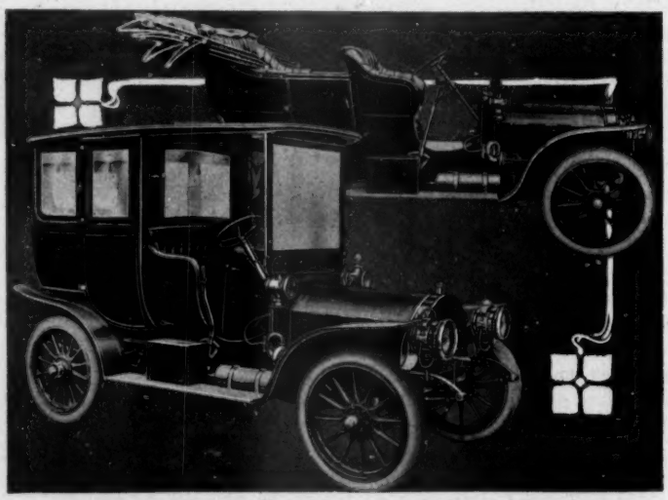
the waterjackets. When removed the jackets can be readily cleaned. A Briscoe tubular radiator is fitted. Lubrication is by standard and force feed system, delivering four leads to the motor and ignition is by jump spark with current from storage cells and passing through a four-part coil. In transmitting flexible connection to the motor is through a reversed cone clutch carrying a leather facing. Changes in speed are effected by a three-speed and reverse sliding gear transmission carried immediately in the rear of the clutch, there being room, however, between the two for the interposition of a jaw coupling enabling the removal of the clutch without disturbing the motor or gearset. Final drive is by shaft to the live rear axle. This shaft is enclosed in a steel tubing carried at its forward end by a forked member providing a couple of trunnion supports which are in line with the axis of the universal coupling in the driveshaft. This construction, in connection with full-elliptic rear springs pivoted at the top side to the car frame, eliminates the use of a universal joint at the rear end of the propellershaft. Reinforcing this drive system are two tubular brace rods extending from the outer ends of the rear axle casing to the forward end of the tube incasing the driveshaft. The back axle is carried on Hyatt roller-bearings with suitable end thrust bearings. Included in the running gear of this new car is a tubular steel front axle 2 inches in diameter with ¼-inch wall and carrying inverted Elliott knuckles on the end. Braking is through internal and external brakes on the rear hubs, both members having camel's hair engaging surfaces, the internal set acting within a 7⅞-inch drum and the external clamping on a drum 8⅛ inches in diameter. Front springs, of the semi-elliptic type, are 44 inches long and have seven leaves, each 2 inches wide. The full-elliptic rear springs are 40 inches in length. The car framework is a channel steel construction, with straight side pieces, and a channel subframe on which are carried the motor and transmission. The car is made in two models, a five-passenger tourist with 103½-inch wheelbase and 32 by 3½-inch tires and a roadster differing from this in that it has a two-passenger body with rumble seat and 34-inch wheels.

**Holsman Automobile Co.—Holsman**

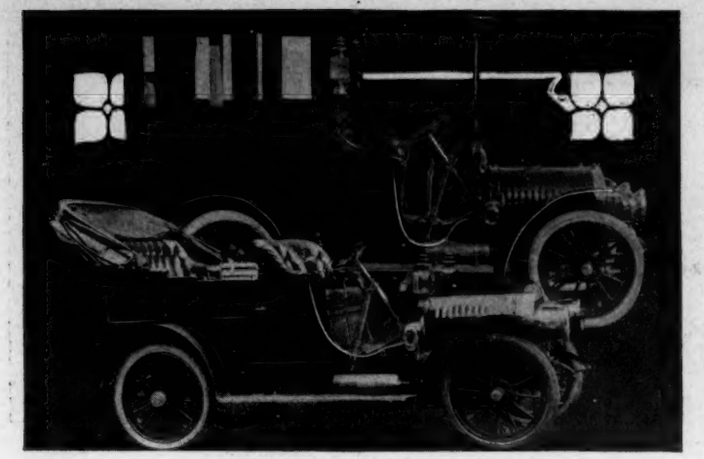
The Holsman buggy-like motor car, a Chicago product, has been on the market for several years, but is seen in a New York show for the first time. It still retains its right to a premier position in this unique field of motor build in spite of the many imitators which have sprung up during the past couple of seasons. The 44-inch wheels in front and 48-inch ones in rear, each carrying 1⅛-inch solid rubber tires, have not been altered nor has the method of driving from the countershaft pulleys to the large pulleys on the rear wheels by many-stranded steel cables. To the list of three vehicles manufactured this season—a runabout, a four-passenger surrey and a touring runabout—have been added two runabout designs, both mounted on the standard 76-inch wheelbase chassis and known respectively as models 9 and 10, the former distinguished by a square piano box and the latter by a box of similar outline, except that the sides are cut away at the ends of the footboard, the same as in standard motor car bodies at the front footboard. Propulsion for these unique vehicles repose in a 10-horsepower, two-cylinder opposed air-cooled four-cycle motor, supported lengthwise midway of the front and rear axles. The cylinders and crankcase are a single casting so made that the bore of one cylinder is exactly in line with that of the other. Placing them in this way does not require the connecting rods to act in the center of the cylinder bore, the rod in the front cylinder operating in the right portion of the cylinder bore and that in the rear cylinder in the left. To do this the bearing surface in the ends of the piston rods are all at one side of the rod. The cylinder heads are cooled by radiating pins and are threaded into the ends of the cylinder casting, and the walls are cooled by integral radiating flanges. In transmitting power from the motor to the rear wheels the ordinary transmission and differential are discarded, the system being direct from sprockets on the ends of the crankshaft to large sprockets on a swinging countershaft beneath the motor, and on which are two corresponding sprockets, chains connecting the two shafts. On the ends of the countershaft are the pulleys for the final drive to the road wheels. The gasoline tank with 6 gallons capacity is placed in the back of the seat; batteries and coil for ignition are carried on the front side of the dash and within the box serving as a false bonnet; full elliptic springs are used in front and rear, and any tread from 56 to 62 inches may be obtained. Steering is by lever, and such features as float-feed carbureter, double spark plugs, forced lubrication, lever control over throttle, automatic inlet valves and general equipment are made use of.

**Dayton Motor Car Co.—Stoddard-Dayton**

To visit the Stoddard-Dayton stand is to examine the new motor, which properly deserves to be termed the magnet of the new car, notwithstanding the improved transmission system and the body equipment with all its added refinements of line and finish. The motor, a 35-40-horsepower one, differs from all preceding engines used in these cars in that its cylinders, with a bore of 4⅝ inches and 5-inch stroke, are cast in pairs and have the intake valves located in the bottom of ports on the right side and the exhausts similarly situated on the left side, the arrangement calling for the use of two camshafts, both of which are completely encased within the aluminum crankbox and driven by enclosed half-time gears at the forward end of the shafts. The comutator, positioned on the top of a vertical shaft on a level with the cylinder heads, is located in the



TWO NEW STODDARD-DAYTON MODELS



MODELS F AND C, RAINIER

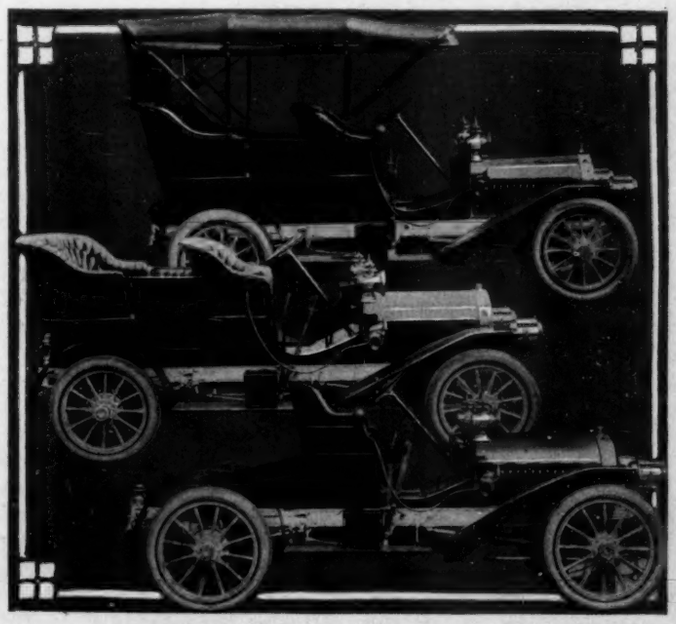
recess between the cylinder pairs at the right side and takes its drive by spiral gears from the intake camshaft. The water pump is carried on the opposite side and driven by a separate shaft. Finishing the interior of the cylinders includes the primary boring, followed by a grinding process, with a gun-barrel finish imparted by lapping with crude oil and ground glass. The crankshaft revolves on three bearing boxes of nickel babbitt all hand-scraped; long bronze lifter cages prevent valve pounding. To further insure quietness, the half-time gears are made of rawhide, and the valve lifter studs fitted with fiber disks are noiseless when the lifter strikes the valve stem. The cylinder waterjackets are continued downward to the bottom of the stroke and the piston carries three machined compression rings. In lubricating by a pressure feed, mechanical oiler driven by ball-bearing eccentric and strap, the feed is directed to the main engine bearings, from which the oil passes outwardly to a grooved eccentric ring, thence through tube connections direct to the lower connecting rod bearings. In the base of the case the usual splash is maintained. In the ignition two-storage batteries are used in connection with a dash-quad, separate-unit coil. Actuated by a heavy pressure spring, the leather-faced internal cone clutch can be removed by uncoupling the forward universal joint and dropping the shifting yoke. The transmission of the three-speed selective type remains much as at present, the H quadrant in which the change speed lever works being carried in the floor of the foot board, with the change speed lever inclined outwardly at its top to escape the knees of the driver. The most notable change in the transmission system is the dispensing with the tubular torsion principle of the present season and the introduction of two side radius rods, each pivoted to the axle housing and extending forward, practically parallel with the driveshaft, ending with a ball and socket union in a bracket carried on the underside of the frame. The rear springs are now shackled at the forward end instead of pivoted direct on a frame bolt, so that the only service called upon them to do is that of carrying the weight of the car, the radius rods absorbing all driving strain. A few commendable body changes presented are: The introduction of a small tool box as a divider between the front seats; forward fenders that rise gradually to the top center of the wheel and which have mudflaps uniting with the frame on the inside and vertical mud flanges on the ouside; and a large baggage-carrying compartment beneath the tonneau floor, the floor also inclining forward, forming a convenient brace for the rear seat passengers, in short, much the same as enjoyed by the passengers of the front seat. Timken roller bearings are used throughout.

**Buckeye Mfg. Co.—Lambert**

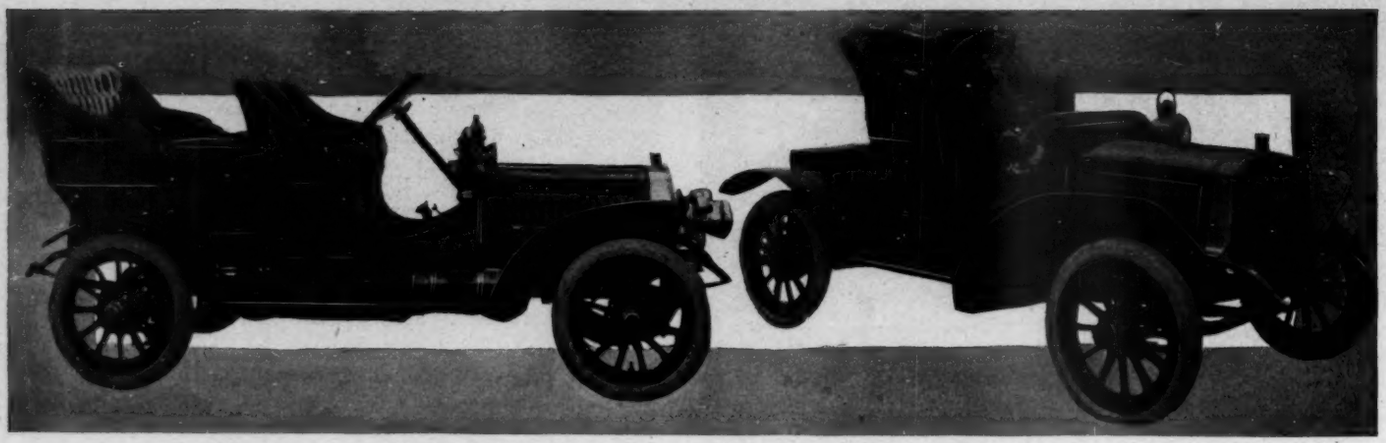
Admirers of the Lambert friction-driven cars of past seasons will find these cars retaining the same form of friction transmission, consisting of a large friction disk on the rear end of the crankshaft. Contacting with this is a friction wheel carried on a cross shaft, the friction wheel capable of being moved across the face of the disk to give different speed ratios forward and for reverse. But while these parts remain the same the double chain drive previously used has been abandoned, except in the two largest models, a shaft transmission from the cross shaft being used. This propeller shaft is not centrally located equidistant from the frame sidepieces as in most shaft-driven cars, but is carried medium close to the right side of the frame, the reason for this resting with the fact that the gear wheels on the cross shaft have to be well to the right end of the shaft to permit of moving the friction wheel from side to side over the face of the friction. Taking the strain off this shaft are two radius rods extending from the ends of the cross shaft to the housing of the back axle, paralleling the drive shaft throughout its entire length. The method of moving the friction wheel across the face of the disk remains as formerly, as does the system of engaging the wheel and disk. The motor plant on Lambert cars is now confined to a 36-40-horsepower four-cylinder Rutenber motor with separately cast cylinders and bore and stroke of 4½ and 5 inches, respectively. These motors are carried on a three-point suspension in front of the dash and have the mechanical oiler carried on the right front corner of the engine bed, the carbureter low at the left, the water pump on the front end of the camshaft and the commutator on the top of a vertical shaft at the back of the fourth cylinder, its drive coming from the camshaft. In the runabout car an angle steel frame is used and in the three touring machines angle steel, reinforced with wood, is used in a couple, and angle iron with a wood reinforcement in the remaining ones. Three brakes are fitted—one on the cross shaft carrying the friction wheel and emergencies expanding within rear wheel hub drums. The full elliptic spring is retained in all models at the rear. Semi-elliptics carry the front end of all frames. The four models are designated as follows: F with side-chain drive, 32 by 4-inch tires, 106-inch wheelbase, weighing 2,700 pounds and accommodating five passengers; model G, for seven passengers, having side chain drive, 32 by 4-inch tires, 106-inch wheelbase and 56-inch tread; model H, for five passengers, and having 32 by 3½-inch tires, shaft drive, and 105-inch wheelbase, and model J, the shaft-driven runabout with 32 by 3½-inch tires, 105-inch wheelbase, and seating two persons.

**Rainier Co.—Rainier**

Nothing evidences the general satisfaction experienced with Rainier machines so much as the fact that the motor, horsepower, the wheelbase, the ignition and the general design of the 1907 Rainier are the same as in the present model, the efforts of the



THREE OF THE MORA LINE



MITCHELL COMPANY'S LATEST — A TOURING CAR AND RUNABOUT

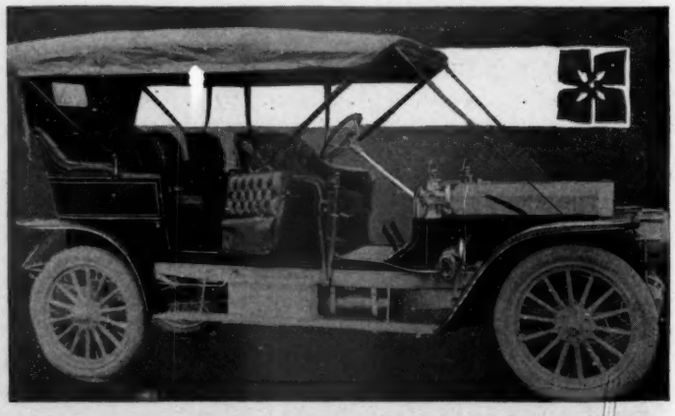
company having found vent for improvement in detail and refinement. In this connection the make-and-break parts for the low-tension ignition system have been carefully protected from dirt and the vertical igniter rod bearings take their lubricant from wick oilers which communicate with reservoirs of large capacity. A simplification of the spark control marks another achievement, resulting in the easy removal of the ignition blocks when examinations are necessary. The bearings of the crankshaft and the connecting rods are now white brass instead of bronze, the white brass being favored because of its wearing qualities and the fact that it will not cut the crankshaft. Pursuing this wave of minor improvement: Attention is directed to an improved mechanical lubricator, worked by means of a steel belt in place of the previous push rod action; the clutch is a simple leather-faced cone with cork inserts in the leather to make engagement more progressive and elastic; in place of the two semi-elliptic rear springs a platform suspension is used and the front semi-elliptics while retained are made heavier and in their redesigned form dispense with bolts and holes. Oil holes are provided on all spring hangers, and a unique method has been followed in attaching the front springs to the axle. The maker has materially increased the wearing surface of the internal expanding brakes, the design suffering slight changes to conform with the increased size. A change also is seen in the surface of the propellershaft brake, it being perceptibly enlarged, with the aim of facilitating the handling of the car in crowded thoroughfares. The wheels have been made heavier.

**Mitchell Motor Car Co.—Mitchell**

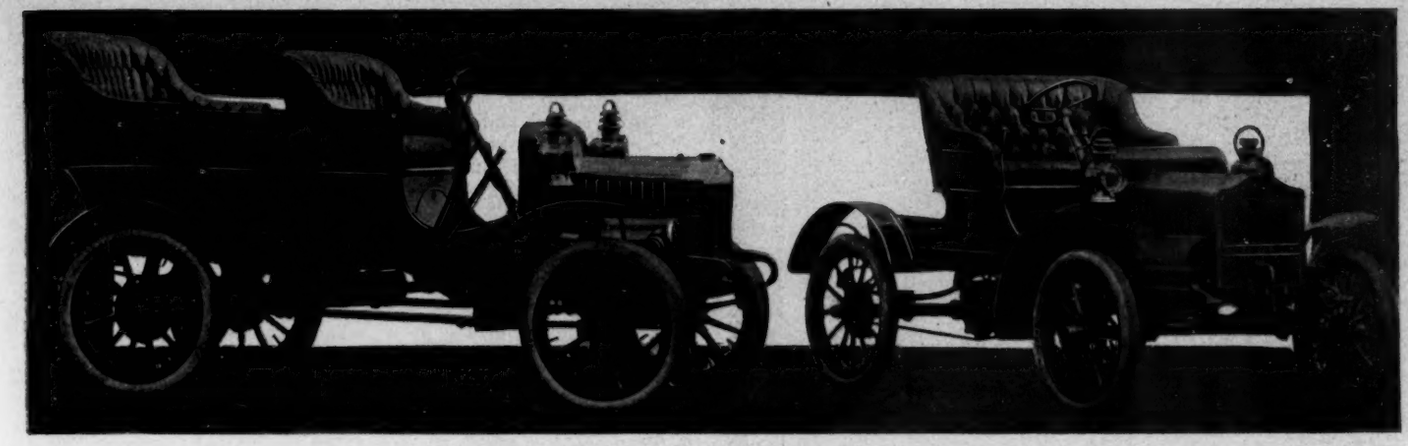
Two pleasure models are being pushed by the Mitchell concern for 1907, the leader being a 35-horsepower touring car and the other the well-known runabout. Both of these have motors, transmission and other parts practically identical except changes due to differences in the size of parts. The Mitchell motor remains much as it was this season, except that in the runabout the bore has been increased ¼ inch, it now being 3¾ inches, while the stroke remains the same at 4 inches. Following up the other features of this runabout in which changes have taken place, it is noted that the wheelbase has been lengthened 4 inches, bringing it up to 90; 2 inches have been added to the front springs, making their measurement 40 inches; the McCord lubricator, carried this season on the dash, has been placed on the right side of the motor; the crankshaft is still carried on five bearings suspended from the top half of the case, and all of these bearing pedestals are braced by cross bridges in the case, whereas formerly only the two end ones and the center bearing were so supported; half-time gears are still enclosed in the forward part of the crankcase, reposing practically in the hollow supporting arm of the case. The only change in the transmission is that the shifter mechanism has been taken from the right side and is now carried in the upper half of the case. The other change noted in connection with this transmission is that the regular brake formerly located on the driveshaft in rear of gearcase is now placed on the rear hubs, it taking the form of a clamping band acting on the same drum that the expanding emergencies do. Instead of the Brown-Lipe steering gear, a Warner style is introduced; front wheels are carried on ball-bearings, the other bearing surfaces throughout the car remaining as before. The body has been made 1 inch wider; a one-piece metal dash takes the place of the three-piece one of this season. The body of the car has been altered so the back of the seat is one easy curve, with straight middle section from side to side, instead of conforming to the curvature of the individual seats. The model F touring car for five passengers in comparison with the present model D-4 has ¼-inch larger cylinder bore, 4½ inches with 5-inch stroke; 8-inch longer wheelbase, 108 inches; tonneau several inches wider and longer, a better quality of upholstering and other refinements. It uses 32 by 4-inch tires and weighs 2,300 pounds.

**Mora Motor Car Co.—Mora**

Seen for the first time at a New York show and with a history of less than 1 year to its credit, the Mora car nevertheless has hosts of admirers who have been won to its side by the unique unit power plant which it uses. This plant has as its foundation two large aluminum castings, one forming a support as well as the lower half of the crankcase for the motor, and the other performing a similar function for the sliding gearset, the union between the two being a depressed portion forming a chamber for receiving the flywheel containing the cone clutch. Both of these support parts, which, besides being rigidly bolted to each other, extend laterally throughout their entire length to the straight sidepieces of the main frame, to which they are bolted at seven points on each side, four for the front portion serving as the motor base and three for the transmission part. Built on this basic casing at the front is the 24-horsepower four-cylinder motor with cylinders cast in pairs and with integral water jackets and intake and exhaust valves side by side in the bottom of ports on the left, one camshaft sufficing for both sets of valves. These cylinders are mounted on the top portion of the crankcase and

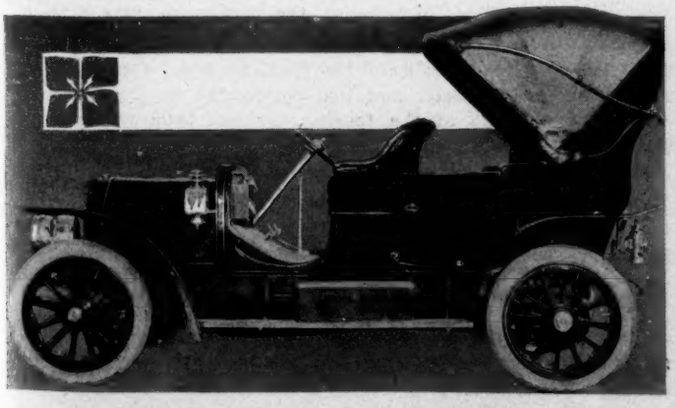


WELCH CAR, SHOWING SEATING CAPACITY FOR SEVEN PEOPLE



TOURING CAR AND RUNABOUT SEEN ON THE MAXWELL STAND

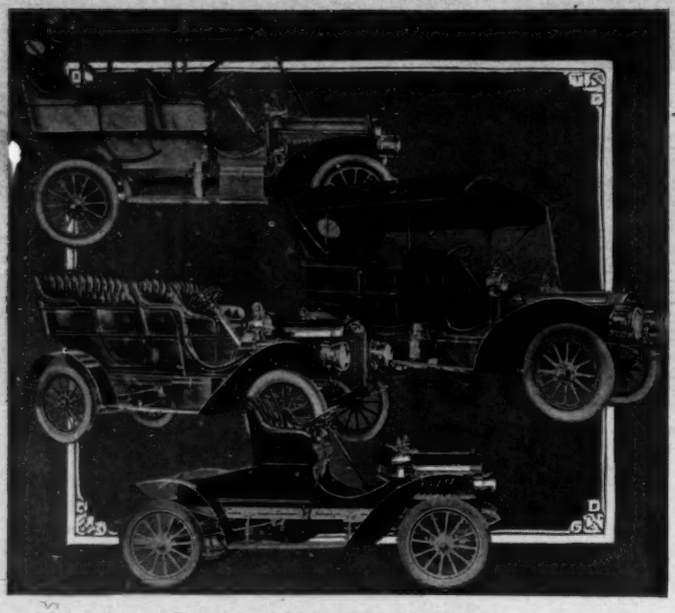
between this part and the lower are carried the motor bearings. The support of the gear case is identical, both main and countershaft bearings being carried on the lower supporting half of the case, the top half forming the upper half of the bearings as well as the housing for the gears. Final drive is by shaft with double universal joint. The clutch is of the cone type leather-faced acting within the flywheel and pedal released. Supported on the aluminum crankbox and engine support is the steering gear, as well as the column and wheel. The unit construction is the undoubted feature of the car. Most important in this is the extending of it sidewise until it meets the frame piece and bolting it rigidly thereto throughout its length, thus stiffening the frame construction and the frame in turn stiffening the united engine and gear support. The under surface of this aluminum casting support is a clean aluminum pan from front to rear, ribbed longitudinally along its center in the motor part and doubly so in the transmission part, with reinforcements of cross-webs throughout its length. The adjacent ends of the two halves of this—that for the motor and that for the gear case—are first accurately machined, then bolted together, and the outside edge surfaces for the upper cases and journal boxes are all machined at one setting, making perfect alignment of the three crankshaft bearings, the clutch and the four bearings of the gear case possible. In assembling this power plant the crankshaft of the motor and the main and countershaft of the gearset are first aligned on the lower case, after which the upper half of the crankcase and the top half of the gearbox are placed in position, the motor being built up from the bottom and dissembled from the top downward. Crankcase accessibility is through large inspection plates on either side. Not to be passed over in the inspection is the driving of the combined interrupter and distributor by a horizontal shaft gear driven from the camshaft opposite the rear pair of cylinders. The other ignition parts include current from storage cells taken through a single coil on the dash and delivered to the spark plugs carried above the valve ports. The spring suspension incorporates a semi-elliptic transverse front spring carried above the forward axle and a platform system in the rear. Braking is through two internal emergency brakes on the rear wheels, two clamping pedal brakes acting on the outer surface of the same drums. The framework of the Mora is made of maple sills, straight from front to rear and stiffened by armoring through the center with a piece of carbon steel $\frac{3}{16}$ inches thick and 4 inches deep imbedded in the wood and held therein by a series of rivets. Besides the roadster and tourer marketed during the present season, the company has added a special design of roadster, using the standard chassis, the body differing from the present roadster by the use of individual front seats and a rumble seat on the back deck. The roadsters displayed by this manufacturer of the Mora are built with 98-inch wheelbase and the tourer with this measurement 103 inches; 3½ and 4-inch tires are carried on the 32-inch wheels of the roadster and tourer, respectively.



MOORE CAR MAKES ITS DEBUT IN THE PALACE

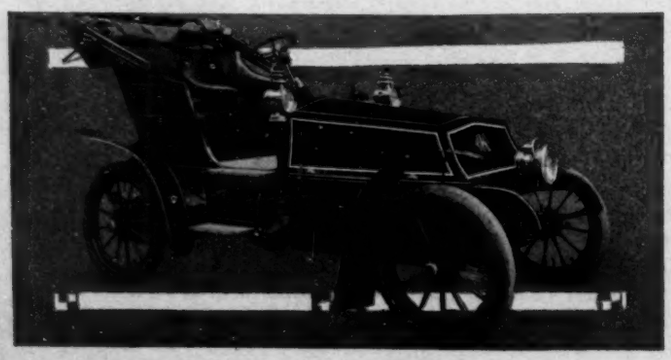
**Thomas B. Jeffery & Co.—Rambler**

Two distinct types of cars are offered by the Jeffery concern for the approaching season, one of these classes being two models, a runabout model 27 and touring car model 21, in which two-cylinder horizontal opposed water-cooled motors are carried under the center of the car body, with the cylinders carried lengthwise. The other class, also comprising two touring cars, models 24 and 25, each has a vertical four-cylinder motor and sliding-gear transmission, one of the models, 24, with shaft drive and an entirely new transmission, and the other, 25, with a sliding gear set as used this year and side-chain drive. In the first class, that with horizontal motors, exceptional changes are noted in that the motor and planetary gearset are a unit plant, the cylinders hugging the left side piece of the main frame and the aluminum housing forming an oil-tight compartment for the transmission bolted rigidly to the right side of the crankbox. In the runabout a 14-16-horsepower motor with 4½ and 5-inch cylinder bore and stroke is used, and in the touring car the same size of motor rules. Each cylinder is cast in one piece with offset valve chamber on the upper side, the valve stems lying along the top side of the motor and actuated by a couple of camshafts housed entirely within the top portion of the crankcase, the use of two shafts being favored so that by having one shaft well to the front and the other well to the rear of the crankcase opening, the entire top is left free for making adjustments of the crankshaft bearing or tightening the connecting rods. The entire top of the crankcase is a removable aluminum cover. The transmission of the planetary type gives two forward speeds. Being encased and running in oil, it is clothed with the many advantages which accrue from any gearing operating in an oil bath. This casing in conjunction with the motor is carried on a three-point support and all parts relating to the two are accessible from above, there being nothing beneath except a wire netting protecting the machinery plant. The connection between the motor and gearset is a multiple disk clutch. The runabout body renders this amidship power plant all the more accessible in that it is hinged to the framework at one side and locked at the opposite. By loosening two knurled hand nuts on either side of the body, the body



RAMBLERS—MODELS 24, 25, 21, 27

may be tipped to an angle of 45 degrees, exposing the entire motor and transmission. Duplicating the hinging and locking parts on each side makes it convenient to raise whichever side of the body is most desirable. The runabout has a wheelbase measuring 90 inches and has body lines accentuated by a deeply concaved dash, flaring forward fenders joined at their lower end to short running boards, and 30 by 3½-inch tires. The touring car has a 100-inch wheelbase, a detachable tonneau and hollow dash. Referring now to the second class of cars, those with four-cylinder motors and sliding-gear transmissions, the smaller one, model 24, is a shaft-driven proposition with an entirely novel sliding gearset incorporated with the propeller shaft housing at its forward end, the only universal joints between the motor and back axle being a double one between the motor and the gearset casing. The gearset is housed in a most compact case with the main and countershafts in the same vertical plane and the changes in speed made by sliding gears progressively on a squared shaft. In the top of this housing, as well as that enclosing the differential in the back axle, are large inspection plates. The motor in this model is improved by making it accessible from the side and not from below by the removal of the crankcase base as commonly used. In this new motor the crankcase opens at the side, a single plate giving access to the entire crankshaft and camshaft with all of their bearings and adjustments. The motor is hung directly from the mainframe. The big Rambler touring car, model 25, with its 40-horsepower motor, is similar to the present model 15, retaining this type of motor with valves in the head operated by lift rods and rocker arms, and sliding-gear transmission housed in a separate case, containing in its rear the jackshaft and differential, and driving to the back wheels by side chain. While radical changes are wanting, the refinements consequent upon a year of building and experimenting are found.

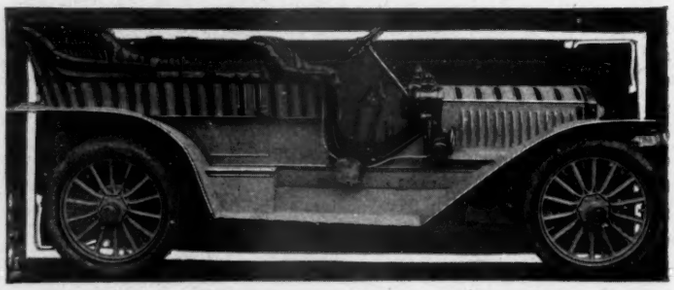


LANSDEN'S NOVELTY, THE ELECTRETTE

Both of these large cars have the new Rambler balanced clutch, by which the engagement may be made as gently as possible by virtue of an extraordinarily powerful spring by which the clutch is finally seated and is in thorough engagement.

**Dorris Motor Car Co.—Dorris**

This year-old concern branches out with its 1907 models to the extent of showing four cars—tourist, limousine, runabout and polished chassis, each with a four-cylinder motor of the company's make and design. The 1907 Dorris shows refinement all along, but the changes in design are not many. The size of the cylinders remains at 4¼ by 5 inches, but the camshaft has been altered so as to give the valves $\frac{1}{16}$ inch more lift. The new motor has forged walking beam levers to actuate the valves in the cylinder head instead of those made of bronze, and there is fitted in the bottom of each cylinder two semi-circular pieces of brass to act as splash plates, designed to prevent an excessive oil supply reaching the plugs. The transmission remains the same, three speed and reverse sliding gear, with interlocking device, which is released only when the clutch is released. Heretofore the clutch lever was also used to operate the transmission brake, but in the new cars this feature is omitted and a separate foot lever, to the right of the clutch lever, performs this duty and at the same time releases the clutch. The clutch lever, however, operates independently of the brake lever. The clutch has been changed materially, though the disk principle is retained. Heretofore there were nine sets of plates, alternate pressed steel and bronze, each set being carried on studs, one by the flywheel and the other on the transmission side. These were engaged by one large central enclosed spring. Now there are five sets of alternate disks of bronze and cast iron. Whereas the old disks were a fraction less than ⅛ inch in thickness the new plates are ¼ inch thick and the plates are engaged now by means of three outside springs, set 120 degrees apart. These



FRAYER-MILLER WITH ITS QUAINT STRIPING

are carried over studs that act as guides for an outside plate, against which the springs rest. The springs are held on the studs by heavy nuts, cottered, and when needing adjustment the nuts are turned as desired. The outside plate referred to has a small brake operated by the clutch pedal to prevent it from rotating by momentum and thus hindering the engagement of the gears in the transmission. The wheelbase of the Dorris has been increased to 102 inches, the torsion rod has been extended so the radius is the same as that of the drive shaft, the drive shaft and universals and the rear axle and component parts have been made heavier and the rim weight of the wheels reduced, the tonneau of the touring car has been widened and deepened and the bonnet and radiator have been altered to give a far better appearance than those on the 1906 car. The limousine body is on the regular chassis, but in the runabout the seat has been placed well back, the steering post inclined, a rakish-looking back deck added, making a smart-looking vehicle.

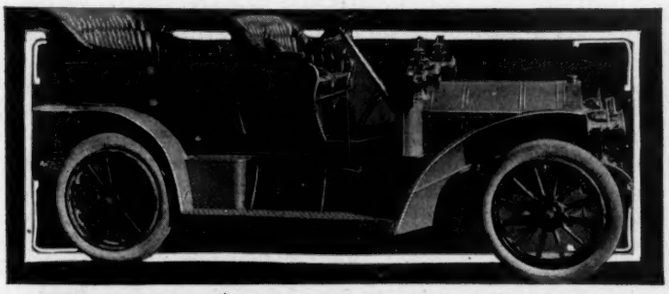
**Lansden Co.—Lansden**

This exhibit space contains the electric exhibited for the first time a year ago and a 1-ton open-top express wagon, both electric vehicles. The former is a racy type of runabout with a radius of 50 miles on one charge and having a speed of 20 miles per hour. It has a many-celled Edison battery carried in

front beneath a low metal bonnet hinged to the dash. Control of the vehicle is centered on the hand wheel mounted on a very much inclined steering column. The wheel base measures 90 inches, tires are 30 by 3½-inch pneumatics, the complete weight approximates 2,000 pounds and drive is from a one-motor equipment by chain to the back axle. The open-top express wagon also uses Edison battery carried in a tray beneath the framework and has an accredited mileage of 25 with a speed of 10 miles per hour. Features of its running gear are 88-inch wheelbase, 56-inch tread, 32 by 3-inch solid tired and 3,000-pound weight.

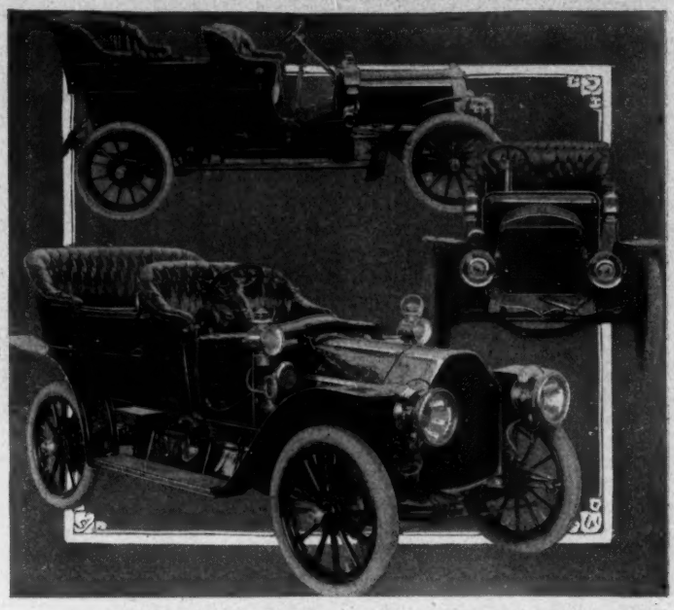
**American Motor Car Co.—American**

The American roadster is the magnet at this stand, with its frame carried beneath the axles, retaining a 9-inch clearance, and the subframe supporting the motor and transmission higher than the main frame. The apparent aim in this runabout has been the securing of a low center of gravity for the motor and gearset, yet leaving good clearance. The idea of so suspending the weight beneath the axle is claimed to increase the life of the tires in that the impact from the recoil of the springs is upwards, thus lightening the load on the tires, whereas with the framework above the axles the opposite is claimed to be the case. In attaching the front springs to the top of the side frame piece brackets are attached to the frame, and to the top of these is bolted directly the eye of the spring. At the front the forward springs are shackled to the upturned ends of the frame pieces through long linkages, similar linkages serving at the back end of the rear springs. Apart from this the roadster is attractive with the top of its bonnet but little above the top of the 36-inch wheels and the seat nestled snugly in front of the back axle, with a luggage trunk behind it and a large rectangular fuel tank between the frame pieces and in rear of the back axle. The steering column is given a racy slope and the front fenders rise at 45 degrees from the front end of a short run-



CRAWFORD PRODUCT FOR 1907

ning board, from the rear end of which rise the back fenders. The dash is of racing style. Propelling this roadster is a four-cylinder, water-cooled motor with cylinders cast in pairs, the bore and stroke measuring 4¾ and 5 inches. Valves are side by side on the right, opened through lifters actuated by a single camshaft. Half-time gears are entirely enclosed at the forward end, and an even distribution of motor parts is attained by carrying the carbureter centrally at the right with the water pump and high-tension magneto driven from one shaft on the left, the magneto resting on the rear arm of the motor and the pump located nearly opposite the space between the front and back pair of cylinders. A battery is carried in reserve. The return water pipe from the cylinder heads branches in front of the first cylinder, sending a branch to the right top of the radiator and another to the left top, short hose lengths being inserted in each. Use is made of a leather-faced cone clutch with a set of auxiliary springs to ease engagement; changes in speed are through a standard progressive sliding type offering three forward variations and a single reverse, and final drive is through cardan shaft. Besides this model there is shown a tourist machine with a somewhat larger motor, a 45-horsepower, having 5 by 5-inch cylinders. The frame on this car is carried on semi-elliptic springs above the axles. In assembling the engine and transmission the subframe has been done away with and from the front of the engine to the

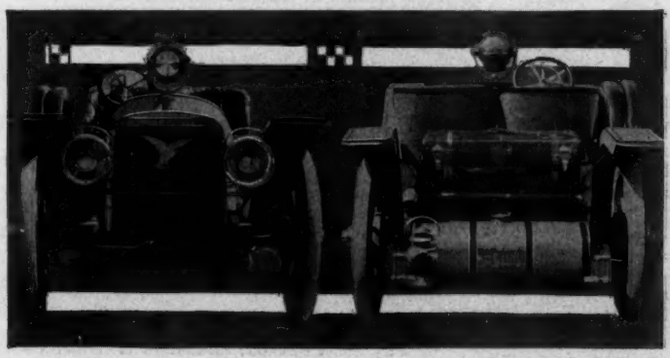


SIDE AND FRONT OF THE DORRIS AND THE MARMON

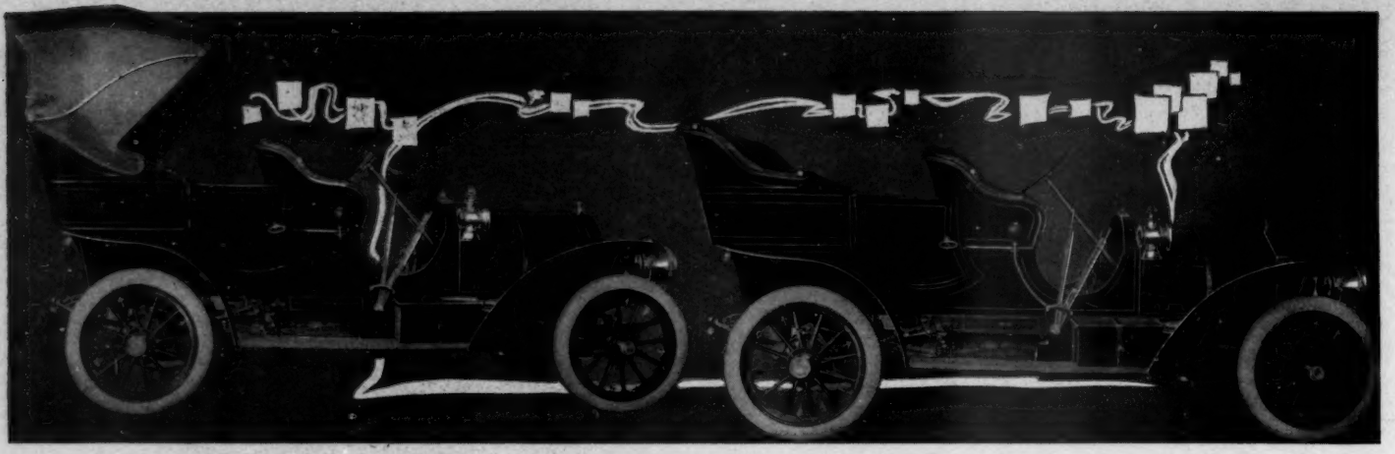
rear of the transmission this power plant is attached to and made a part of the frame. The wheelbase is 116 inches, wheels 36 by 4 inches, the front axle is of I-beam section without weld, a floating rear axle is installed, and braking is through a band brake in rear of the transmission on the drive shaft and internal emergency brakes within the back hubs.

**Nordyke & Marmon Co.—Marmon**

In preparing its line for 1907 this manufacturer has continued its present air-cooled car unchanged, except for the increasing of the wheelbase from 90 to 96 inches by simply carrying the front axle forward, and the changes necessary in the body lines because of this lengthening process. Another improvement is the use of annular ball bearings and self-aligning ball-thrust bearings around the differential, instead of roller bearing as formerly. Besides this continued model, however, is the new car designated F and entirely different from the present in that it makes use of a three-disk clutch and selective sliding gear transmission, the planetary type heretofore used being discarded. This model, rated at 35-horsepower, uses the four air-cooled cylinders mounted in pairs at angles of 45 degrees to the vertical, two sloping to the right and two to the left in V fashion at 90 degrees to each other. The bore and stroke are 5 and 4½ inches respectively, these figures in the present cars being 4⅝ and 4½ inches respectively, the tendency shown here being that of making the cylinder bore ½-inch larger than the stroke. To counteract any piston rocking, the piston is made fairly long and carries six compression rings. Using a larger motor has called for a general increase of the cooling flanges as well as increasing the diameter of the fan. To reduce noise, the driving gear of the camshaft is made with a bronze center carrying a fiber ring, the crankshaft is of chrome nickel steel carried in babbitt



FRONT AND REAR VIEWS OF AMERICAN RUNABOUT

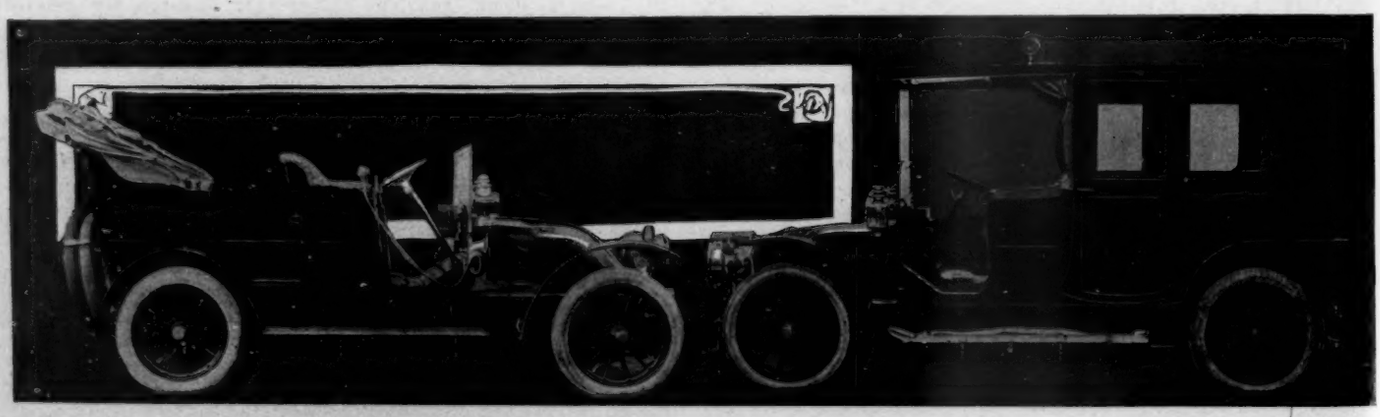


MODELS OF THE PUNGS-FINCH, EXHIBITED BY THE ZIM-ROCK MOTOR CO.

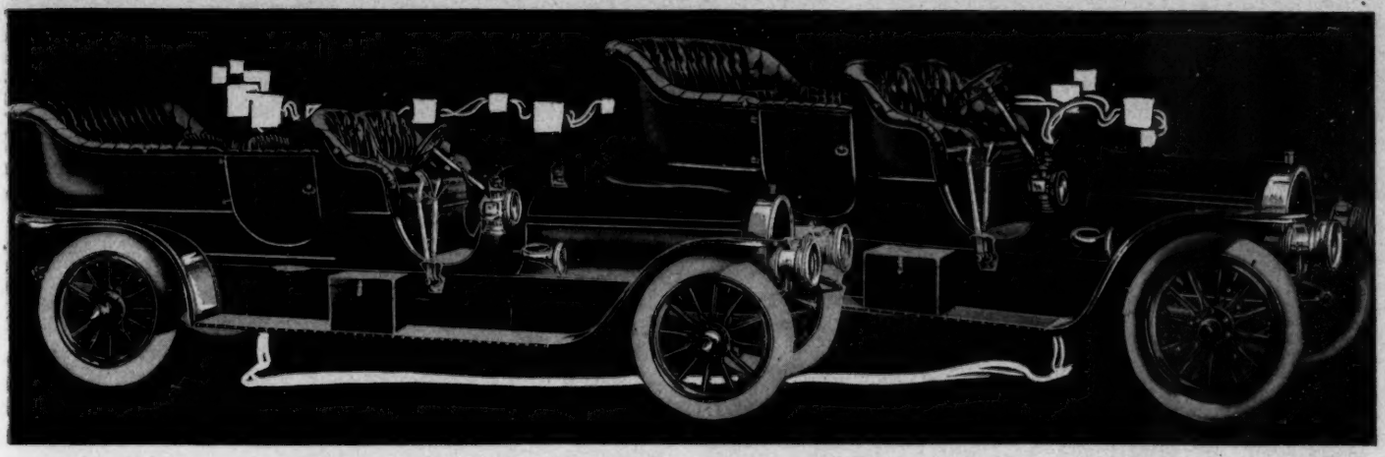
bearings, the connecting rods are babbitted at the lower end and bushed with phosphor bronze piston end and the oiling system is altered, in that the pump has been moved to the middle of the motor and the relief valve added as well as pressure gauge on the footboard. The oil is fed in the hollow crankshaft and by boring the shaft throws, it is fed by centrifugal force to the lower bearings of the connecting rods. A distinctly modern tendency appears in enclosing the flywheel with its disk clutch and the selective sliding gear transmission in one housing and supporting the same, together with the motor on the three-point suspension framework regularly used on Marmon cars. The clutch is a three-disk affair—two cast iron plates with cork inserts attached to the flywheel and an interposed saw steel disk. Engagement is by a series of small coil springs arranged so as to exert ample pressure on the disks near their periphery. Conspicuous in its construction is the supporting of the back end of the mainshaft by Hess-Bright bearings located within the hub of the large gear on the front end on the propeller shaft in the rear of the case, this bearing ordinarily being of the plain type. By continuing the crankcase well to the rear, the rear bearings of both shafts are entirely enclosed, giving a dustproof construction. The rear axle has been rebuilt and is now carried on Hess-Bright instead of Hyatt roller bearings. The rear road wheels are carried on a couple of races of Hess-Bright balls supported on the axle tubing, which is made with a reduced diameter at the outer ends, and the axle shafts at their inner ends carry integral flanges to which the differential gears are studded. In the running gear alterations noted are the use of scroll-end, full-elliptic springs in place of the plain elliptic of former years, the use of a screw and nut steering gear in place of the worm and segment type and the frame is of chrome nickel steel. The wheel base measures 104 inches and 34 by 4½-inch tires are fitted in rear and 4-inch tires in front. Added to the surprises of the show is the eight-cylinder car with 128-inch wheelbase. The motor is a doubling up of the present four-cylinder. The cylinders are 4½ by 4¼-inch, mounted in two sets of four each on opposite sides of the crankcase at 90 degrees to each other. The rating is 60 horsepower. In general design the motor is like the four-cylinder. The new style of Marmon steering gear used on this model is of the screw and nut type with a Timken roller bearing above and below the worm and other Timken bearings carrying the shaft of the radius arm. The gear operates in oil and takes the place of the worm and sector type previously fitted to Marmon machines. The crankshaft is carried on five bearings and for lubricating the shaft it is bored from end to end.

**Crawford Automobile Co.—Crawford**

The Crawford company is out with two distinct models. They differ principally as to the size, one having a motor developing 35-horsepower and the other one showing 50-horsepower. For the coming season the Crawford remains firm to its faith in side chain drive, it serving in both of the models, the transmission to the jackshaft from the motor starting with a multiple dial clutch of forty disks, all carried within an oil-tight case. Following this is a sliding gearset operating on the selective principle. The practice of making the bore and stroke of the motor nearly alike is apparent in both motors, these measurements in the 50-horsepower car being 5 and 5½ inches respectively and in the 35-horsepower machine 4½ and 5 inches. Both intake and exhaust valves are operated mechanically and are made interchangeable, the diameter of each set being 1¾-inch. A further step in keeping the car in the front rank is the general use of ball bearings, which serve throughout in the machine, the motor bearings excepted. The 35-horsepower car is now made with an 106-inch wheelbase and is hung 3 inches nearer the ground, the front springs in spite of this measuring 42 inches in length and the rear pair 50 inches. The rear of the body has been increased in length 6 inches, the door is hung 2 inches nearer to the rear, and the back of the body is



CHARRON, GIRARDOT & VOIGT'S CONTRIBUTION TO THE FOREIGN SECTION

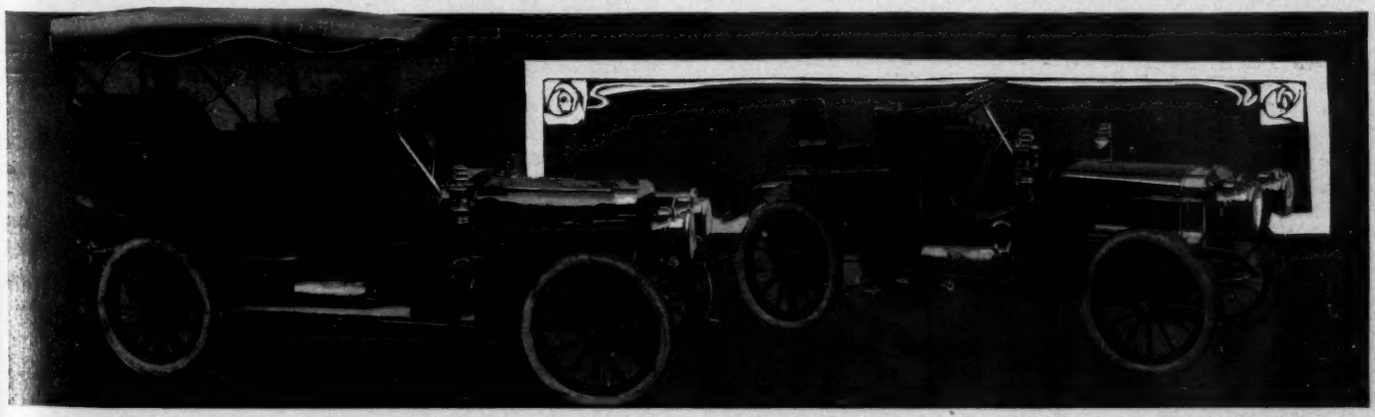


THE NATIONAL COMPANY'S SIX-CYLINDER AND FOUR-CYLINDER CARS

2 inches lower from the seat and cut further back at the corners to give a long low arm effect. Under present measurements the body at the back seat is 53 inches from side to side. the front seat is made 1½ inches lower in the back than the rear seat and is also finished with the level arm effect. The body has a width of 36 inches at the frame, which widens to 44 inches and is featured by having not a single working part attached to it, leaving it free to be lifted off, the complete chassis with all working parts remaining. In making the body metal has been used throughout, it being carried on a wooden skeleton. To make the likeness to wood greater the body is trimmed all over with light steel half-oval moulding, the crowning feature being that the completed body weighs 150 pounds less than many other metal bodies of the same accommodation. The 35-horsepower machine resembles the large car in all respects, the measurements being, of course, different.

**Oscar Lear Automobile Co.—Frayer-Miller**

Air-cooled by jacketing the separately cast cylinders and injecting into the tops of these cylinders, adjacent to the valve ports, a forced current of cold air which escapes around the exhaust valve housing and around the base of the air jacket, together with the use of radiating spines covering that part of the cylinder walls traversed by the pistons, is continued by this firm, the new machine being improved in several respects, many of which doubtless are direct outcomes of the experience gained in the building of the three Vanderbilt cup racing machines. Conspicuous in these changes is the use of one camshaft for opening the intake and exhaust valves instead of two as formerly. This shaft is carried on top of the crankcase at the left side and is housed by three casings, one at either end covering the cams for the front two and back two cylinders and a central housing covering the half-time gears, these gears occupying a position between the second and third cylinders instead of at the front or back of the motor. The exhaust valves are now opened as formerly with the vertical lifter rod pivoted to one end of a bell crank, the other end of which bears on the outer end of the horizontal valve stem; but to open the intake valves carried on the opposite side of the cylinder lifter rods rising at an angle of 45 degrees to the vertical and pivoted to the ends of bell cranks that bear upon the valve stems are needed. These lifter rods are in pairs, those for the first two cylinders rising between the first and second cylinders and those for the other two cylinders rising between the third and fourth cylinders. The cams are carried on the same shaft, one set being arranged for a vertical lift and the other set for lifting at 45 degrees. The bell cranks for the front two and the rear two cylinders are supported on a short horizontal shaft carried by brackets from the valve housing of these respective cylinders. The two-shaft scheme in connection with the motor is well followed out by carrying the commutator on the front end of the camshaft and driving the lubricator by wire belt from the rear end. The spark plugs are now placed horizontally in the rear right corner of the cylinders instead of between the valves as formerly; and the exhaust pipes, a separate one for each valve housing, are held into the housing by threaded union, making it possible to adjust each separately or remove one at a time. The clutch is of the internal expanding type carried within the flywheel, and the transmission, designed along standard lines and of the sliding gear variety, is carried in a case amidship from which drive to the back axle is through cardan shaft. This is somewhat different from the type of transmission used on the Vanderbilt cup racers, which was incorporated with the differential housing in the back axle. A very racy standard has been secured in the touring car body for seven-passenger service which has long sloping front fenders, medium length of running board, and exceptionally long tonneau accommodating five passengers. This tendency to raciness is accentuated by having the back of the front seat very low and the back of the rear seat but little

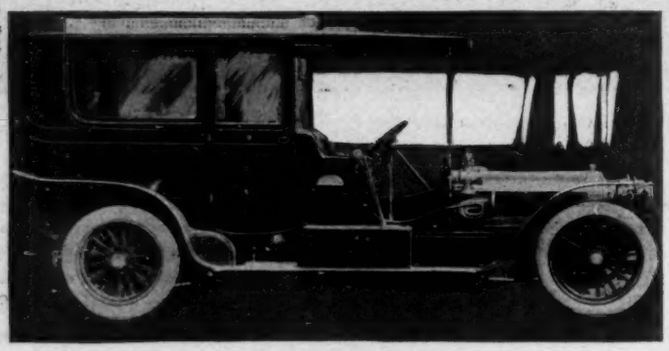


A COUPLE OF HIGH-POWERED CARS OF THE ACME COMPANY, OF READING, PA.

higher. The body part is striped vertically and the bonnet horizontally across the top. The car is built with 122-inch wheel base. The horsepower rating is 50, and the bore and stroke 5½ and 5⅛ inches respectively. Thirty-six-inch wheels with 4½-inch tires are fitted in front and rear. The present 24-horsepower car is continued and natty runabout bodies for each chassis are furnished.

**York Motor Co.—Pullman**

York model E 20 horsepower with four separately-cast cylinders each with 3¾-inch bore and stroke carries many changes over its predecessors, notable among which are the use of in-



DELAHAYE LIMOUSINE, A FRENCH PRODUCTION

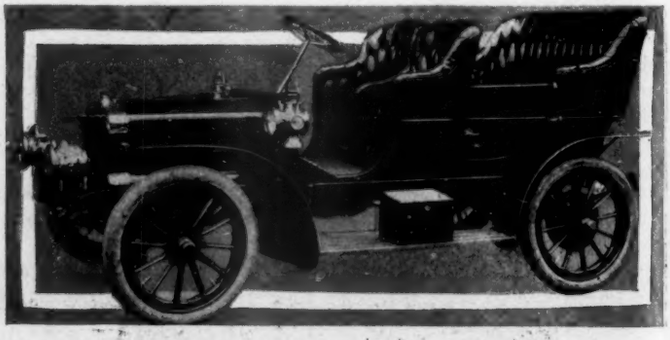
tegral jackets for each cylinder instead of a united waterjacket for the four cylinders. Of scarcely less importance is the adoption of a standard jump spark system with current from storage cells and the timer on the top of a vertical shaft close to the flywheel and connected by I-tension wires with the plugs carried above the inlet valves. The timer casing is stationary, the spark being advanced or retarded by a shifting cam on the shaft within the case. Intake and exhaust valves are now side by side in ports on the right and a combination intake and exhaust one-piece manifold is used. The crankshaft is carried on five bearings with Parsons white brass bushings a metal also used in the lower ends of the connecting rods, but superseded by bronze at the wristpin. Side inspection plates in the crankcase have been eliminated, accessibility to the connecting rods, crankshaft bearings and crapkshaft being to the lower half of the case. The clutch is a leather-faced cone and transmission is through a chrome nickel steel set with both shafts supported on ball-bearings. Drive is by shaft. Both brakes are now carried within the rear hubs; the back axle is a Timken roller-bearing product; a tubing 2½ inches in diameter constitutes the front axle and a steering gear of the nut and screw type is used. Tires are 30 by 3½ inches and a new vertical tube radiator with flat instead of cylindrical tubes is fitted.

**National Motor Vehicle Co.—National**

Although National cars will still be recognizable by their round radiators and cylindrical bonnets, the radiators will be of the vertical tube style rather than honeycomb. Additional cooling will be provided by a ball-bearing fan in the rear of them. One National model, F, is practically the same as the present four-cylinder machine with its 4½ by 5-inch Rutenber motor, but the 1906 six-cylinder will not be continued, the new six-cylinder machine being very much modified, chief of the changes being the use of a new National engine built entirely in the National shops. Characterizing this motor is the use of cylinders with 4⅞ and 5-inch bore and stroke, the horsepower rating being fixed at 75. Cylinders are separate castings with valves disposed oppositely and opened by direct lifter rods, necessitating the use of two camshafts. The valves are made interchangeable. Not to be passed over in this new motor is the use of ball bearings supporting the crankshaft. Both of the camshafts, with extra long Parson's white bronze, are used as a bearing surface in both ends of the connecting rods. A complete double ignition scheme is used, the more important one consisting of a gear-driven, high-tension magneto connected with an automatic governor and emergency hand control, and the lesser light a battery of storage cells with its current high-tensioned through a single-part coil and delivered to its plugs by a distributor. Double sets of plugs are carried. In attaching the intake, exhaust and water pipes to the cylinder packing points have been replaced by tapered nipples with clamps. The crankcase is in two parts and interchangeability of parts has been prominent throughout. In oiling a nine-feed Crandall oiler sends separate leads to the cylinders, one to the transmission, one to the rear axle system and one to the clutch. A Schebler carbureter is used on all National models, as is the double system of internal expanding brakes, consisting of two concentric drums within the back wheel hubs, with expanding members within each, one set pedal and the other lever operated. The National clutch remains with its leather-faced cone and engagement springs, but a new selective transmission replaces the old sliding gear one, the new member offering three forward speeds. Another novelty in the transmission is the use of a floating back axle carried throughout on annular ball bearings, as are all other parts of the car. The wheelbase approaches America's highwater mark, measuring 127 inches, wheels are 36 inches and carry 5-inch tires, the main frame has a 5-inch channel and a subframe is used for carrying the motor and transmission. Tubular front axles, remain and front springs measure 44 inches and rear springs 56. A four-cylinder car, 50-horsepower, is fashioned exactly after this big six, the cylinders having the same dimensions and such parts as ignition, oiling, clutch transmission and back axle being alike, except for size. Thirty-four by 4½-inch tires are used all around, the frame is of 4½-inch channel, the springs are 40 and 50 inches long in front and rear respectively and the tubular radiator is introduced. The wheel base is 112 inches. In addition to these three models the company has three runabouts, which are artistically displayed to the best advantage.

**Zim-Rock Motor Car Co.—Pungs-Finch**

Makers of the Pungs-Finch show, through their agent, the Zim-Rock Motor Car Co., two 1906 models, the larger a 35-40-horsepower machine, exhibiting a variety of new constructions with this concern. Cylinder measurements are 4¾ by 5 inches, respectively, and the four cylinders are cast in pairs, with valves placed oppositely and actuated by vertical lift rods, which receive their lift from cams carried on a couple of shafts.



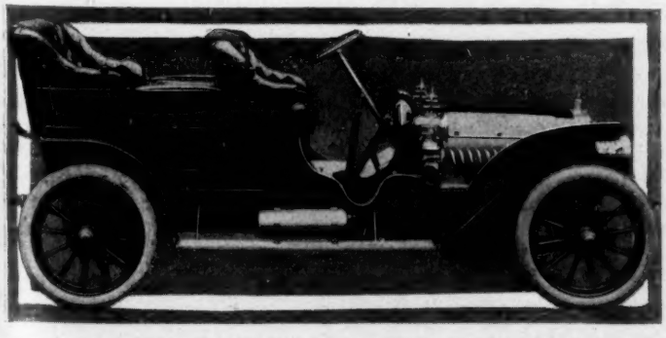
TASTY LOOKING MODEL OF THE PULLMAN FOR 1907

To facilitate inspection and cleaning of the integral waterjackets, large plates form the top of the jackets, the return pipe to the radiator leaving from the center of each plate. A simple Y intake pipe is used on the right side, the carbureter being carried close inside of the channel frame section. A system of jump spark ignition, with the plugs carried vertically over the intake valves, commutator on the top of a vertical shaft at the forward left corner of the front cylinder and driven from the exhaust camshaft, and coil on the dash with current coming from storage or dry cells, is installed. The one-piece exhaust manifold has a variable diameter pipe from the front cylinders and slopes back in the direction of the base of the dash, at which point it is

jointed by a similar pipe, sloping in a similar manner, the union of the two forming a very acute angle in the hope that pressure from the exhaust of the rear two cylinders will not create back pressure against the front pair of cylinders. The company has fallen in line with the tidal wave towards selective transmissions, using one giving three forward speeds and one in which it is not necessary to clash gears for the second and third speeds, these speeds being gained by interlocking dogs, making it possible to go from one to the other at any speed without stripping gears. Instead of keying gears they are made a fit on the hexagonal shaft and all gears are of six pitch and 1⅛-inch face, both shafts running on Hess-Bright ball bearings. In conjunction with this improved gearset is the use of a multiple disk clutch operating in oil and a rear axle construction in which the car weight is maintained on the housing parts, leaving the drive shafts to bear the driving strain. Both brake sets are within the rear wheel hubs, one set expanding and the other contracting on the drum; the front axle is of I-beam construction; the wheelbase is 106 inches; tires measure 32 by 4 inches; 19 gallons fill the fuel tank; and the car weighs 1,900 pounds. The 22-horsepower chassis, designated as model F, has four vertical 4 by 4½-inch cylinders, and transmits power through a standard clutch, three-speed sliding gearset, drive shaft and non-floating rear axle, carried on ball bearings. It has an attractive runabout body with concaved dash sloping back at the base along the side of the footobard, seats carried a little in front of the back axle and rising straight-front fender, running board and small rear fenders conforming to the curvature of the wheel.

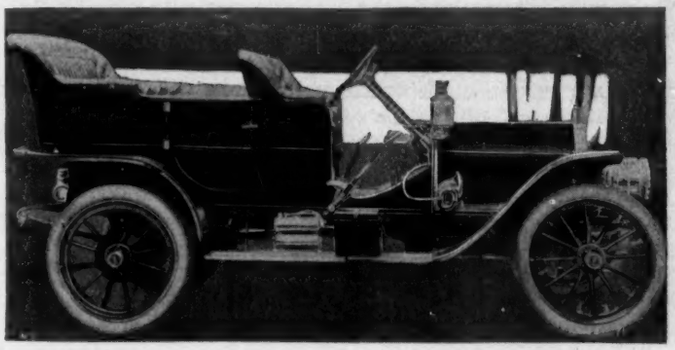
**Wayne Automobile Co.—Wayne**

Wayne offers three models for the coming season—N, an entirely new 30-35-horsepower model, and R and K, two models continued over from the present season. The R is a seven-passenger 50-horsepower car, and K has a 35-horsepower motor and is designed for five-passenger service. The model R car, like all of the others, has a vertical motor with 5½ by 5-inch cylinders, sliding gear transmission, shaft drive and the braking system, including an external band on the transmission shaft and internal brakes on the rear hubs. The wheelbase is 117 inches. The model K has 4¾ by 5-inch cylinders, three-speed transmission, shaft-drive, 102-inch wheelbase and 32 by 4-inch tires. Coming now to the new car, model N, its power plant lies in four water-jacketed cylinders cast in pairs, each with a bore of 4⅝ inches and 5¼-inch stroke. Valves are



NEW MODEL PUT OUT BY THE PREMIER COMPANY

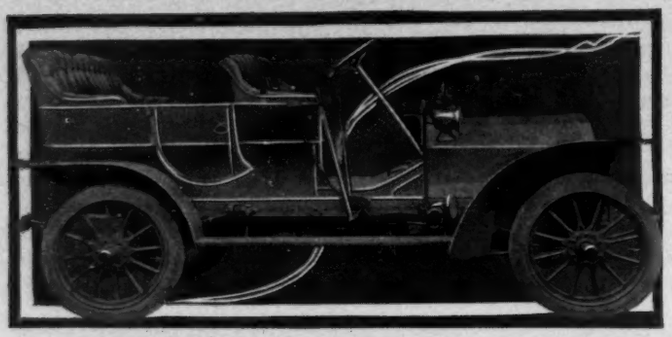
carried side by side in the bottom of ports on the left and opened by direct lift from a single camshaft. In order to distribute the several motor parts equally on both sides, the carbureter is placed low on the right side and connects with the intake valves through a long pipe crossing to the left between the pairs of cylinders, then branching to the front and rear castings. This pipe, together with the exhaust manifolds, is held to the valve port by one yoke for each cylinder casting. In the motor nickel steel valves, Parson white brass for crankshaft bearings, phosphor bronze for wrist pin bearings, and enclosed halftime gears are used. Ignition is by storage battery with roller contact timer mounted on a vertical shaft rising adjacent to the dash, and plugs carried over the intake valves. The clutch, of the internal expanding type, operates in the flywheel, which is bolted to an exceptionally large flange on the crankshaft. The flywheel has a drum cast on the rear side containing the expanding clutch. Within this drum is another of smaller diameter of cast aluminum, and attached to a flange on the coupling to the gearshaft. To this drum one end of a steel band faced with leather is attached. The other end is attached to a lever pivoted on the drum, while the action of a helical spring serves to expand the band into the drum of the flywheel. In releasing a wedge pushing against the roller on the lever is required. Undoubtedly another of the interesting features of this new model is the carrying of the transmission on the back axle, having its casing coupled with that housing the differential and axle drive shafts. The gearset is of the sliding selective type, giving three forward speeds with direct on high. It has the two shafts in the same vertical plane with the countershaft beneath and both carried on plain bearings. The front end of the case is removable and through this opening the gears are assembled. The rear axle construction includes a Timken roller bearing for the driving pinion at its large or front end and a white brass bearing at its rear end. The axle shafts, 1⅜-inch in diameter and of hammered steel, are supported on Hyatt roller bearings. The front axle is tubular construction and carries Elliott type knuckles. Both set of brakes act on the rear wheels, operating on a large drum, the expanding set brought into use by pedal and the external set for emergency use, lever applied. A set of four semi-elliptic springs 30 and 52 inches long respectively supports the press steel framework at front and rear. Wheels are 34 by 3½ and 4 inches in diameter.



WAYNE IDEA IN TOURING CAR MODEL

**Premier Motor Car Co.—Premier**

Few more conspicuous changes are seen in the building than that noted at the Premier booth, where four water-cooled cars are exhibited, they succeeding the air-cooled types that have been built by the Premier people since the inception of the company. The new motors used in all four models have a rating of 24-horsepower, the cylinder bore and stroke measuring 4¼ inches each and, contrary to expectation, the air-cooled motor of the present season has not been discarded in its entirety. The crankcase with all its accompaniments is retained in full, the difference now being that it carries four water-cooled cylinders instead of air-cooled castings. In adding the water-cooled cylinders a staggering arrangement was necessary owing to the pushrods for opening the valves rising at what would be the corner of the cylinder were it mounted with valve ports at right angles to the crankshaft, this position of the pushrods being that required in the air-cooled motor. While the appearance is quite uncommon, the arrangement has not the least effect on the motor action, as the cylinder bore is on center with the crankshaft line and the valve ports are similarly located with reference to the camshafts. In changing to the water-cooled style a Mayo radiator has been placed in standard position. To maintain circulation a large rotary pump is added, being located on the forward right motor arm, taking its drive by shaft and gear from the half-time gears on the front end of the motor, all of



AIR-COOLED MODEL OF THE AEROCAR CO.

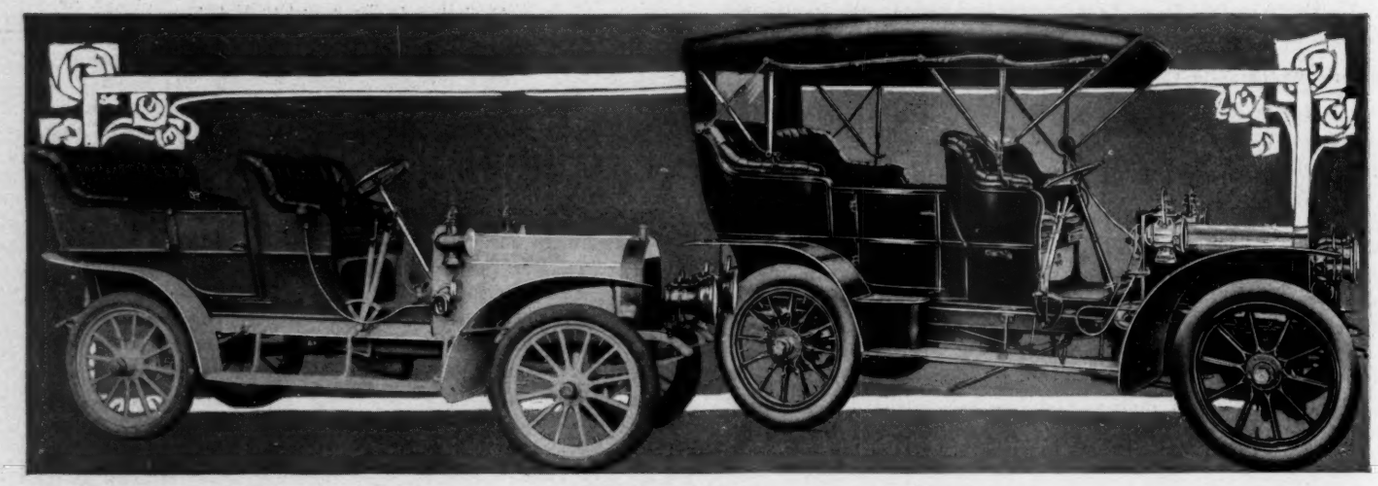
which are enclosed. Water enters the lower right corner near the intake valve ports on the right side. The return pipe to the top of the radiator leaves from the top center of the cylinder heads. This cooling system constitutes the chief motor change, jump spark ignition and forced lubrication remaining. In the transmitting system the first element, the multiple disk clutch, is altered in that it is now encased in an aluminum housing, permitting of its running in an oil bath. A couple of disks are added, there being now five steel plates carried on studs attached to the flywheel. Alternating with these are four phosphor bronze disks fitted onto the spindle attached to the transmission shaft. A selective transmission gives three forward speeds with a single reverse and final shaft drive remains in use. Characterizing the running gear is the use of four full-elliptic springs, the front and rear pair located outside of the frame-pieces and attached by a bracket clipped to the top center of the springs and rigidly secured to the frame. The touring car body follows lines pursued the present season. The runabout with its folding runabout rumble seat and racy fenders is an attractive roadster, and the landaulet combines standard lines throughout.

**Pierce Engine Co.—Pierce-Racine**

For the first time in its history this concern offers a high-powered car of the 40-horsepower class with 4½ by 5½-inch cylinders. This motor is of typical construction throughout, with its vertical cylinders mounted on a two-part aluminum crankcase and water-cooled by radiator, pump and fan. Ignition is by jump spark with current from storage or dry cells. In transmitting the power, a cone clutch, sliding gear transmission, jointed propeller shaft and live rear axle are included. The transmission, giving three speeds forward and one for reverse, marks a new step by this concern, it previously having adhered to a type of planetary transmission affording the same number of speeds and with direct drive on the third. Ball-bearings are used for carrying main and countershafts in the transmission set and also the differential and drive shafts in the floating rear axles. The braking scheme comprises four brakes, two expanding within drums on the rear hubs and the others contracting on the outer face of these drums, one set sufficient for regular use and the others for emergency only. In the running gear many standard parts are noted, among which is the screw and nut steering gear connected with a well-inclined column carrying spark and throttle controls above the steering wheel; a tubular front axle centrally dropped and fitted with Le Moine steering knuckles; semi-elliptic springs in front and rear measuring 42 and 50 inches respectively; 25-gallon fuel tank beneath the front seat; 34 by 4½-inch tires carried on detachable rims and 106-inch wheelbase and 56-inch tread. The body is 1907 in most respects, having a severely plain bonnet hinged along the top and with other hinges at the top of the vertical side parts; concaved metal dash conforming to the bonnet outline; straight line body; plow-share front fenders and medium length of running board. The emergency brake and change speed levers are carried outside of the body at the right end of the foot board and both have push buttons for locking them in position on their quadrants.

**St. Louis Car Co.—American Mors**

Exhibiting for the first time at a motor car show the American Mors car is shown in its three sizes, 14-18, 24-32 and 40-52 horsepower, and fitted with a line of bodies such as touring car, limousine and demi-limousine. The 24-32 car, with cylinders in pairs and valves opposite, requiring a couple of camshafts for the direct lift valves, has the bore and stroke at 4¼ and 5⅝ inches, with the cilinders featured by the use of aluminum water-jackets fitted over each pair of cylinders with the unions carefully finished to prevent leaking. A dual ignition scheme employed specializes a low-tension make-and-break outfit with current supplied from a Mors magneto carried accessibly on the motor bed, but for starting a jump spark outfit is fitted, it being cut out as soon as the motor is under way. Motor cranking is further facilitated by compression relief cams on the exhaust camshaft, these being brought into action by pulling the camshaft forward by a handle extending forward through the radiator for this purpose. Motor lubrication is by splash, a given quantity of oil being carried beneath each pair of cylinders due to a central cross partition in the crankcase. On the car dash is an aluminum-cased mechanical oiler working by plunger pump operating by lever arms and vertical connecting rod from the inlet valve camshaft. This has two feeds, one to the central casing of the inlet camshaft from which the oil, after caring for the shaft, augments the splash in the case and the other extends to the camshaft gears. On the oiler is also a hand plunger pump for forcing oil directly into the motor crankcase, which is a one-piece housing with openings in the ends through which the crankshaft is inserted and over which fit the caps supporting the ends bearings of the shaft, the center bearing



PIERCE-RACINE AND THE AMERICAN MORS AS SEEN AT THE SHOW

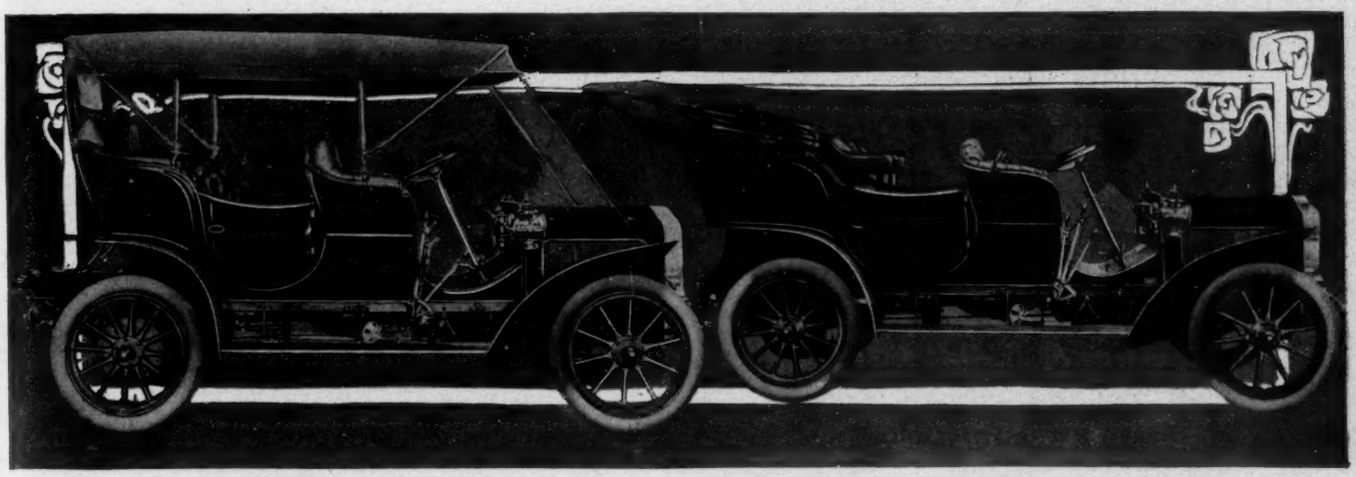
taking its support from a pedestal. In the 40-52 motor, the crankcase is in two parts, an upper one, apparently, supporting the crankshaft bearings and the lower one doing duty as an oil chamber for the splash lubrication. Uniting the motor with its four-speed and reverse gearset is a leather-faced cone clutch, the cone member having rubber pads beneath the leather covering for the easing engagements and to prevent violent shocks being transmitted from the motor to the back wheels and vice versa. The gearset operating on straight sliding principles giving direct drive on the top speed has as the characteristic feature the employment of two pinions, one fixed and the other sliding on the idler stub axle used in giving the reverse drive. In the rear of the case is the differential and the center part of the jackshaft, the use of side changes being required for final drive.

**Aerocar Co.—Aerocar**

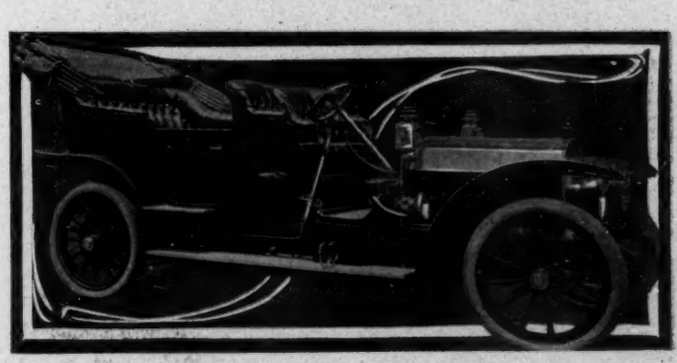
A water-cooled Aerocar has been produced and is exhibited, in addition to the air-cooled production. This has a four-cylinder motor, 5 by 5 inches, being rated at 40 horsepower. The cylinders are separately cast and have integral waterjackets. Each piston is fitted with five rings at the top, while the connecting rods of drop forgings are made adjustable at the crankshaft end and are bushed with bronze and babbitt metal. The crankshaft is 1⅞ inches in diameter and has five 1¾-inch bearings for support. The flywheel is bolted to a flange made a part of the crankshaft forging. The crankcase is made from an aluminum alloy and divided in halves, the upper one containing the bearings and the lower one serving as an oil pan. Supporting arms are attached to the upper half, so that the crankshaft bearings may be reached by removing the lower half of the case. Valves are made interchangeable and are on the left side of the motor, being operated by a single camshaft. The valve lifters are made from hardened steel and bronze and have arc rollers against which the cams strike. The water pipes are brass and the pump, made from bronze, is geared to the crankshaft. Jump spark ignition is used, the commutator being fitted to the top of a vertical shaft driven from the crankshaft by steel spiral gears. A quad coil is located on the dash, while the storage battery and dry cells are carried on the running board. Lubrication is by means of splash, a force feed oiler supplying oil not only to the crankcase but having a lead to each cylinder as well. A radiator of tubular construction is bolted to a cross member of the frame. A multiple disk clutch is fitted. This has fourteen alternating bronze and steel disks, held from turning by four bolts in grooves at the edges, while the steel disk carrier is made in one piece, so that the thrust is on one piece and by a single spring. A separator is provided so as to preclude the possibility of the disks hanging when the spring engagement is released. Sliding gear is used, giving three speeds, drive being direct on the high. The bevel is in combination with the differential. The frame is of pressed steel of channel section and is reinforced with gusset plates and cross members, the motor and transmission being carried on a subframe. Semi-elliptic springs, ball bearings for the rear axle, tubular front axle, 34-inch wheels, worm and nut steering device, transmission foot brake, internal expanding emergency brakes, roomy tonneau, and a weight of 2,500 pounds are other features of this car. Besides this water-cooled car the company is continuing with the present model D air-cooled machine of 20-horsepower, as well as its air-cooled runabout, whose racy lines are already well known. These air-cooled models appear about the same as before, with separately cast cylinders cooled by twenty-one symmetrical integral flanges, giving a total radiating surface of 1,155 square inches, assisted by an air draught created by a 15-inch fan mounted on races of Hess-Bright balls. The transmission system remains as before, as does the running gear, but the body in its altered lines has a different shaped hood, and straighter lines with the back seat much lower, while the scroll effect around the tonneau door is considerably improved. A straight dash succeeds the hollow type and the front fenders now have an integral mudflap on the inner side.

**Bartholomew Co.—Glide**

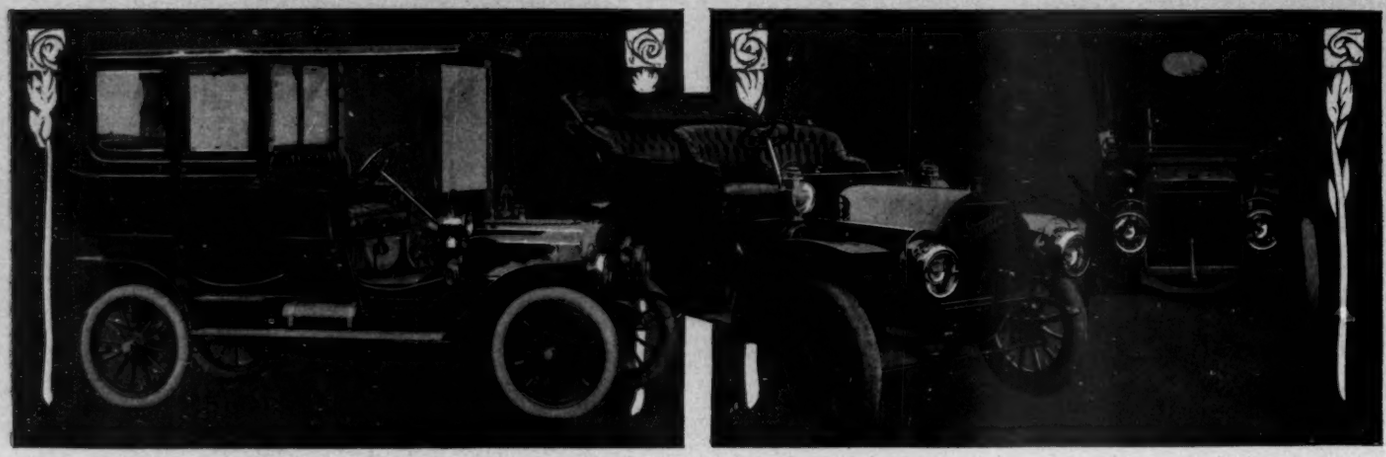
One firm to drop the horizontal type of motor is the maker of the Glide car, it having introduced the 36-horsepower Rutenber motor in its three touring cars, known respectively as model E runabout and E and G touring cars. The six-cylinder car now in course of construction by this concern is still incomplete and is not on exhibition. The Rutenber motors employed in all three models are of the 4½ by 5-inch type and include in their makeup all the refinements of the 1907 product. In the model E cars nothing radical has been attempted excepting in the use of the multiple disk brakes operating on the rear wheels, these brakes being, in short, identical with multiple disk clutches, the engagement of the disks being effected by a revolving ring with an extended lever with three cams on the sides. The contact surface in these brakes is 400 square inches. Four-feed Crandall oilers are introduced, sending two oil leads



TWO OF THE LINE SHOWN BY THE WHITE PEOPLE

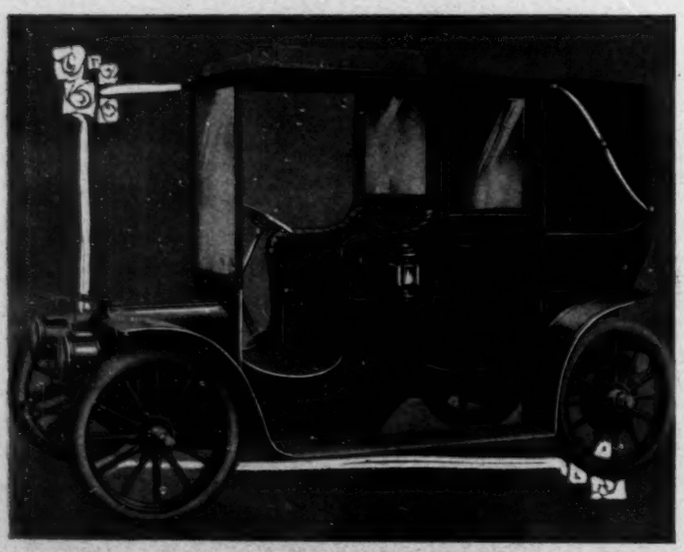


AMERICAN MERCEDES IN NEW FORM



REO LIMOUSINE, GROUT GASOLINE, AND THE GLIDE

to the main bearing to the crankshaft and the other two to the crankcase. Semi-elliptic springs are used in front and the full elliptics of the present season retained at the back axle. The G touring car, with its 120-inch wheelbase and 34 by 4-inch wheels, incorporates the real innovations of the new Glide cars, including the multiple disk brakes already referred to. In this model the selective three-speed transmission is carried in conjunction with the rear axle, there being but one shaft connecting from the clutch to the mainshaft of the gearset. But one universal joint is required in this shaft and it is enclosed in a socket casing in the forward end of the housing. From the sides of this socket are brace rods extending angularly to the end of the axle housing so the entire axle support can radiate around this universal joint axis. Flexible connection with the motor is through a multiple disk clutch carried in the flywheel entirely encased in an aluminum housing and operating in oil. The disks are 13 inches in diameter. A new system of control for the clutch and brake is featured. The left pedal releases the clutch and the right pedal releases the clutch and at the same time sets the brakes on the rear hubs. The outer lever to the right of the driver also sets the hub brakes and throws out the clutch. In getting the changes of speed, the change speed lever is thrust forward for high speed rearward for second speed and pulling it to central is neutral. To get the reverse the button on the top of the lever is pressed and the lever pulled backwards. To get slow speed ahead it it pressed forward with the button depressed. Bringing it again to the perpendicular gives the neutral position. By this method the H quadrant is dispensed with. The lower housing of the back axle is the manganese bronze casting, as are the tubular housings extending from this casting to the drive wheels, while the top of the main housing is an aluminum cap. To get at the axle or transmission, the side door of the tonneau is opened, the floor raised and after removing the three cap screws the body can be jacked up, the axle freed from the spring seating by two bolts on each side. After disconnecting the shifter rods from the gearset, the axle can be backed out of position.



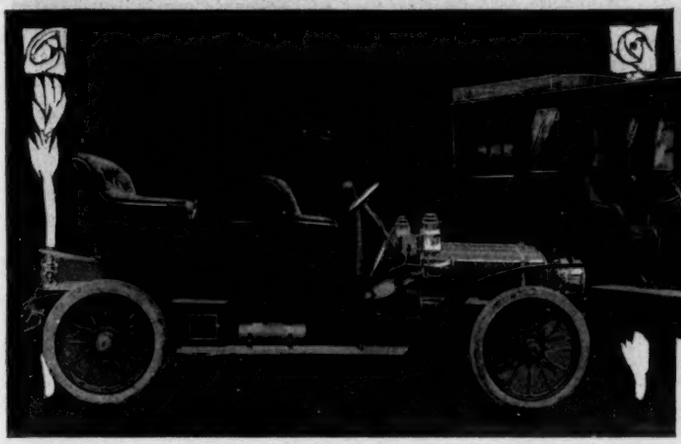
THE B-L-M, A NEW YORKER

**Grout Brothers Automobile Co.—Grout**

Few changes have been made in the 1907 Grout touring car as compared with the present model. One, however, is the lengthening of the wheel base from 102 to 108 inches. The 30-35-horsepower motor with 4½ by 5-inch cylinders remains, as does jump spark ignition with current taken from a battery carried on the running board and delivered by a distributer to the plugs. In the general make-up of the car the drive by side chains is still retained and the front and rear axles are both of square sections, 1½ inches to the side, the latter straight from end to end. Such points as cone clutch, sliding gear transmission, worm and sector steering gear, 32 by 4-inch tires and mechanical lubricating system, are continued. Cooling is by a Mayo radiator connected with pump and 5-gallon water system. Ball bearings are used in all four wheels, front and rear springs are of the semi-elliptic style, a clearance of 10 inches is provided, as is seating capacity for five passengers, and fenders are of sheet steel with the front flanged for protection against mud splashing.

**Craig-Toledo Motor Co.—Craig-Toledo**

It should be announced that this concern is the successor to the Maumee Motor Car Works. There are many novelties in the way of construction in the company's new car, which is fitted with a 40-horsepower motor of the four-cycle four-cylinder type. The car itself is of the runabout order, having a rumble seat and other runabout earmarks. The motor has a bore of 4¾ inches and a stroke of 5 inches, and the cranks are offset 1¼ inches. The cylinders are cast in pairs, have integral water-jackets and the camshaft is integral, the cams being open to the crankcase, all gears being enclosed. The crankshaft is made from a drop forging and has half-boxed journals 1⅞ inches in diameter, long and of Parsons white bronze. Gears are spur and plain bevels, steel meshing with bronze and all housed in aluminum integral with the base of the motor. Cooling is by a honeycomb radiator and a centrifugal pump, the water supply being 8 gallons. A fan is mounted in front of the motor and in addition the flywheel webs are made into fan blades to aid in pulling the heated air from the motor. Ignition is provided for by an Eisemann high-tension magneto and a supplementary storage battery. Lubrication is by splash, but there is an overflow provided, so that the oil supply is kept constant. Oil from a force feed goes first through crankshaft boxes and then into five separate oil pits, each of which has an overflow to a return oilway, which inclines toward and floods the oil pump. The power plant is swung to a subframe on three points, and this subframe is independent of the mainframe, being hung by two bearings on the



BRASIER

GOBRON-BRILLIE

BERLIET

front cross member and the other in the center of the rear axle. The subframe is inclined in line with the center of the rear axle and the front cross member, so that the motor is also sloped. No universal joints are used, the driveshaft being in alignment with the subframe. The clutch is of the multiple disk variety, with alternate brass and ground steel disks, all running in oil. Ball bearings are used to take up end thrust. The transmission is of the progressive sliding gear type, giving three speeds ahead, the shafts running on ball bearings. The transmission gear is fitted with a locking device, which is released by the movement of the clutch lever. The emergency brakes contract on the hub band and are operated by the hand lever, while the foot lever operates expanding brakes against the inside of the same drum. The body is made of aluminum, is mounted on the mainframe, which, in turn, is supported by semi-elliptic front and full-elliptic rear springs. The wheelbase of the car is 112 inches, seats three people, weighs 2,550 pounds, and has 36 by 3½ and 36 by 4-inch tires. The control levers are on the steering wheel.

**Moore Automobile Co.—Moore**

One of the most interesting new machines at the show is the 40-horsepower Moore car, which was expected at the shows last January but which could not be completed in time. The Moore, a high-priced and high-class touring car of large size, is a ball-bearing proposition from front to rear, the motor crankshaft and camshafts being carried on genuine Hess-Bright ball races, as well as all parts of the transmission, back axle and front road wheels, the connecting rods being the only exception to the ball-bearing principle. A three-point suspension is used for carrying the motor upon a subframe which has two supports at the rear on the mainframe by circular bearings and one in front, a swinging link and double pin support to the front steel cross member of the mainframe. The transmission case is suspended at its back end from the mainframe by two trunnions and at its front end by a swinging link and double pin support from a tubular cross piece of the frame. Combined with this method of flexible suspension is the use of a universal joint between the motor and gearbox and other universal joints in the driveshaft, insuring against strains acting on the motor or gearset when the mainframe is twisted. Full elliptic springs serve in the rear, semi-elliptic springs in front, the frame is nickel steel with tubular cross members and the dash is formed integrally with the frame. The motor with its 4½ by 5½-inch cylinders each has a separate casting, with the water jacket formed integrally, the sides of the jackets consisting of plates screwed into position. On top of each cylinder an inspection plate is fitted so carbon deposits on the tops of the pistons can be removed without dismantling the motor. The main part of the crankcase is manganese bronze, the bottom is aluminum, piston pins are made hollow and from chrome nickel steel and have bearings of double the ordinary length. Chrome nickel steel forged in I-section forms the connecting rod, and it has a spherical bearing on the upper half of the crankpin brass, enabling it to adjust itself should there be the slightest misalignment and insuring the brasses always bearing uniformly on the crankpin throughout its length. These crankpin brasses are made of a special bearing metal, with the lower cap extending but one-half the length of the crankpin, allowing the exposed portion of the pin to dip into the oil bath. In addition to this the lubricating is facilitated by the use of scoops carried on the lower cap, these scoops dipping into the oil at the bottom of each stroke, the oil taken up by them passing by ducts into the central or unexposed part of the bearing. But while many parts of the motor are novel, the crankshaft demands the chief attention in this respect, first because of its being carried on five Hess-Bright ball races and also as it is a built-up shaft consisting of U-shaped sections, of identical construction, turned from the solid and bolted together with male and female members, and provided with a space, or collar, for carrying the ball races of the bearings. The crank pins are integral with and form a part of the several crankshaft sections. Camshafts, made of chrome nickel steel, are carried on ball bearings. A triple system of ignition is used, two from high tension magnetos and one from quadruple coil and battery. When running on the magneto the spark advance is automatically cared for by a governor. A triple switch on the top of the steering post enables connection to be made with either or both magnetos or the coil, or to work all three together. Further control of the motor is through the throttle lever. The clutch is of the metal-to-metal type, self-contained within the flywheel and running in an oil bath. It consists of a very light double cone disk and an expanding ring set out against the inner side of the clutch cone by a cam, which in turn expands the clutch disk against a steel bushing keyed into the hub of the flywheel. The transmission, of the selective type, gives four forward speeds with a single re-

DURYEA'S PHAETON TOURIST

verse, and all shafts are attached to the gear by sextuple feathers. The transmission or propeller shaft is a compound flexible shaft of chrome nickel steel, so designed as to allow for a certain twisting or torsion between the gearbox and the rear axle, so a sudden throwing in of the clutch or any road shock are not readily transmitted to the car mechanism. Should the load be too great for the spring mechanism in the shaft a stop is fitted on the external hollow shaft which takes up the load when too great for the elastic drive parts. The main back axle housing is in three parts—opposing cone pieces forming the differential housing and tubular axle sleeves entering these and extending outward, carrying the road wheels on their outer ends. The differential is carried on a shaft of its own and in the ends of this shaft are received the drive shafts of the axle which drive the

Booth of Conover Motor Co.

road wheels through the hubs. Both set of brakes are double acting, the emergencies expanding within their drums and the regular brakes running in a bath of oil and water-cooled. An interlocking device is fitted, which necessitates the complete withdrawal of the clutch before the speed change lever can be moved. A second interlocker is furnished to prevent gears when meshed slipping out of mesh. An automatic sprag is fitted, of the pawl and ratchet type, the pawl acting on ratchet teeth cut in the side of the transmission brake drum and so arranged that it acts quickly to prevent the car running back. The clutch pedal is interconnected with the carbureter throttle, cutting down the gas when the clutch is out. The other operating levers and pedals are of standard construction.

**Conover Motor Car Co.—Conover**

In this, its initial appearance at a New York motor show, this concern displays its detachable tonneau, five-passenger car and its runabout body which can be used on the same chassis when the tonneau body is taken off. The car has as its power plant a four-cylinder Rutenber motor rated at 35-40 horsepower with separately cast cylinders having a bore and stroke of 4½ and 5 inches. As in the standard motor of this make the valves are carried on one side, and the camshaft has the water pump on its forward end. In the flywheel is a typical leather-faced cone clutch affording flexible connection with a selective type of transmission giving three forward speeds. The change speed lever system is not of the H-slot type but the lever works in a single-slot quadrant and has a double-acting latch on its top at the front side. For high and second speeds ahead the top end of the latch is drawn in and the lever worked forward and back in the quadrant slot. The vertical position is neutral. For slow speed and reverse the bottom end of the latch is drawn towards the lever and the lever then moved forward and back in the slot respectively. The two shifter rods from the gearset are attached respectively to a cross shaft with tube surrounding this shaft, and the use of the latch locks the change speed lever with either the shaft or sleeve, according as the top or bottom of the latch is pressed against the level. Final drive is by propeller shaft to a floating type of back axle carried on Timken roller bearings. The front axle of the I-beam style has inverted Elliot knuckles for steering purposes. Operating on drums on the back wheels are the regular brakes, worked by pedal. On the transmission shaft is a clamping band for emergency use only, this brake throwing out the clutch and being used solely for locking the car when standing, the running brakes on the back hubs being sufficiently efficient for stopping the car in case of extraordinary incidents. In the motor white bronze bushings carry the crankshaft and camshaft, the transmission shafts are similarly supported and Timken rollers support the axle. The wheelbase measures 104 inches, wheels are 34 inches in diameter in front and rear and 4-inch tires are regularly fitted. In removing the tonneau one bolt on each side at the front and another near the rear are all that have to be taken off. The runabout body has seating for two and a long sloping baggage deck placed in the rear of the seat.

**E. W. Sutphen—English Daimler**

The three models shown comprise a 30-horsepower, a 35-horsepower and a 45-horsepower, in a limousine, touring car and chassis in the order named. The 1907 car has many new points, the most notable of which is the substitution of a pressed steel frame, with tubular cross members, instead of the reinforced flitch plate frame of last year. Combined with this is a lower frame line and a higher engine, giving greater road clearance. Along with this greater road clearance is the removal of the gasoline tank from the rear to a place under the front seats. The models continue to be all chain drive and in this connection the cross shaft has had its relative position, with the drive shaft, reversed, it now being placed below the frame. It is suspended by brackets below the frame and the sprockets brought level with the road wheel centers. This gives a much clearer side entrance to the tonneau. A transverse or platform rear spring has been added for the cars having 9½-foot wheel bases, but for long bodies the rear springs are carried back on long goosenecks, which, together with longer springs, accomplish the purpose without excessively lengthening the wheel bases. The radiator has been increased by dropping its lower end to a point well below the lower side of the front springs. To this has been added a largely increased pump capacity. A universal joint has been put in just back of the clutch in addition to the one in front of the gear case, giving greater flexibility to the drive on rough roads. The clutch now slides in an extension of the crank shaft which has been run well back from the flywheel for this purpose. This automatically assures perfect alignment. The tension of the clutch spring has been reduced, making declutching easier for the operator. Longer life is assured the brakes by making them wider and larger in diameter. The steering tie rod and its connections have all been moved to a position back of the front axle. The plugs have also been moved from their former position above the valves, now being screwed into the water-cooled portion of the cylinders, for the purpose of reduction of breakages and short circuits. All chassis are built with a tread of 55½ inches, but bases come in 9½, 10½ and 11½ feet. The millimeter measurements of the 30 horsepower are 130 bore by 150 stroke, of the 35 horsepower 140 by 150, and of the 45 horsepower 150 by 150 millimeters.

**E. B. Gallaher—Brasier**

The Brasier cars are given a representative showing in a 25-36-horsepower chassis, mounted on a raised platform; a complete touring car of the same horsepower, a 50-60-horsepower touring car and the famous car in which Thery won the last Bennett cup race. Along with this display is a separate limousine body for the 25-36-horsepower complete car. Like most of the French cars of high repute the 1907 Brasier is in all its important essentials the same as the 1906 model. Of course there are refinements and a few changes in detail have been made which have been prompted by experience. The 25-36-horsepower and the 50-60-horsepower have been retained for 1907 practically as they were this year in their entirety. About the only

change is in the carbureter, which now takes the form of that used by Thery in the Bennett race. This has a throttle valve which is particularly sensitive to any sudden change in range of speed. Two entirely new models have made their appearance for 1907—a 16-26-horsepower and a 30-40-horsepower. The former takes the place of the 15-25-horsepower 1906 model and the latter is an entirely new size, giving a car between the 25-36-horsepower and the 50-60-horsepower. The main difference between the 16-26-horsepower of 1907 and the 15-25 model of this year is that the former has a chain drive which replaces the cardanshaft. In all other essentials these two new models are the same as the 25-36 and the 50-60 chassis of 1906. The slight exceptions that are to be noted in these two models are: A selective transmission; the moving of the radiator further back on the chassis and changes in width, both front and back. The rear width is 36 inches in place of 34 inches and the forward width has been narrowed to 32 inches. The advantages claimed for this is that the greater width at the rear permits better body construction looking toward the comfort of the occupants, while the narrower front makes possible shorter turning in operation. While not alone in this particular the limousine shown furnishes an example of the particularly high class coach work and fittings that is now being produced in this country, embodying not only beautiful finish in paint and leather, but every convenience that can be possibly conceived.

**Duryea Power Co.—Duryea**

The Duryea Power Co. exhibits for the first time something of a novelty in the way of a three-cylinder motor having a rotary valve. Mr. Duryea has been experimenting with this form of motor for something over a year and has become so thoroughly satisfied that it has many practical advantages over the ordinary type of four-cycle internal combustion motor that after numerous demonstrations he has decided to not only use it in the vehicles manufactured by his company but to put it on the market as well. The motor is shown both in one of the Duryea vehicles and in section. The device consists of a single revolving shaft, having three approximately flat cuts, which form the port spaces 120 degrees apart, each port space being designed to accommodate one cylinder. The cutting of the ports in the single piece shaft is designed with the purpose of insuring absolutely correct timing of the valve action. The single cutting for each cylinder serves for both the exhaust and the inlet ports. The three cylinders are made in one casting and have single ports on the sides of the cylinders, all three ports being generously waterjacketed. The ports are of such short length and have such a small amount of service that great efficiency is claimed from this source. There are three positions in which the rotary shaft may be. In the first position there is a practically straight and unobstructed passage of the gas from the carbureter to the cylinder through the short cylinder port, with consequent small wall area. The passage of the incoming charge against the hot cylinder head and igniting device is supposed to prevent the mixture from becoming diluted by the residue of the preceding charge. The next position of the shaft is called the ignition position. When at this point the cylinder port is closed and the wall area and contents become very small, while the surfaces of the valve and valve bushing in contact are large. This method is claimed to insure freedom from leak, and the position of the motor, inclined, as in all Duryea cars, is such that the piston movement throws oil that might be on top of the piston into the port, thus lubricating the valve, particularly at the compression dead center, where the pressure is highest and the need for tight fitting is essential. Both make-and-break and jump spark ignition have been fitted to this type of motor, but Mr. Duryea's idea is make-and-break, with which most of the motors are fitted. When the valve is in the exhaust position there is a practically unobstructed passage for the escape of the hot charge. The ports are 3 inches in length and are designed to operate quicker than ordinary poppet valves, and to be quieter. There is an absolute absence of springs to become weakened. The valve and the lubricating oil on its surface are kept cool by water passing around the ports, as well as through the center of the valve. The valve bushings are removable, so that in case of damage by the presence of any foreign substance passing through the valve and scoring the surface the valve and bushing may be removed without interfering with the cylinder casting. The valve is driven by chain. The spark timer is attached to the valve shaft on the outer side of the chain sprocket, while the water enters and leaves the valve shaft at the opposite end. In general design the engine is more simple than the four-cycle motor and has fewer parts. The area of the piston is approximately 20 square inches, being 5 inches in diameter, while the area of the exposed surface of the valve is only a little over a tenth of this amount, being less than 2¼ inches. The bearing surface of the valve shaft extends the full length of the cylinder.

**G. H. Curtiss Mfg. Co.—Airship Motors**

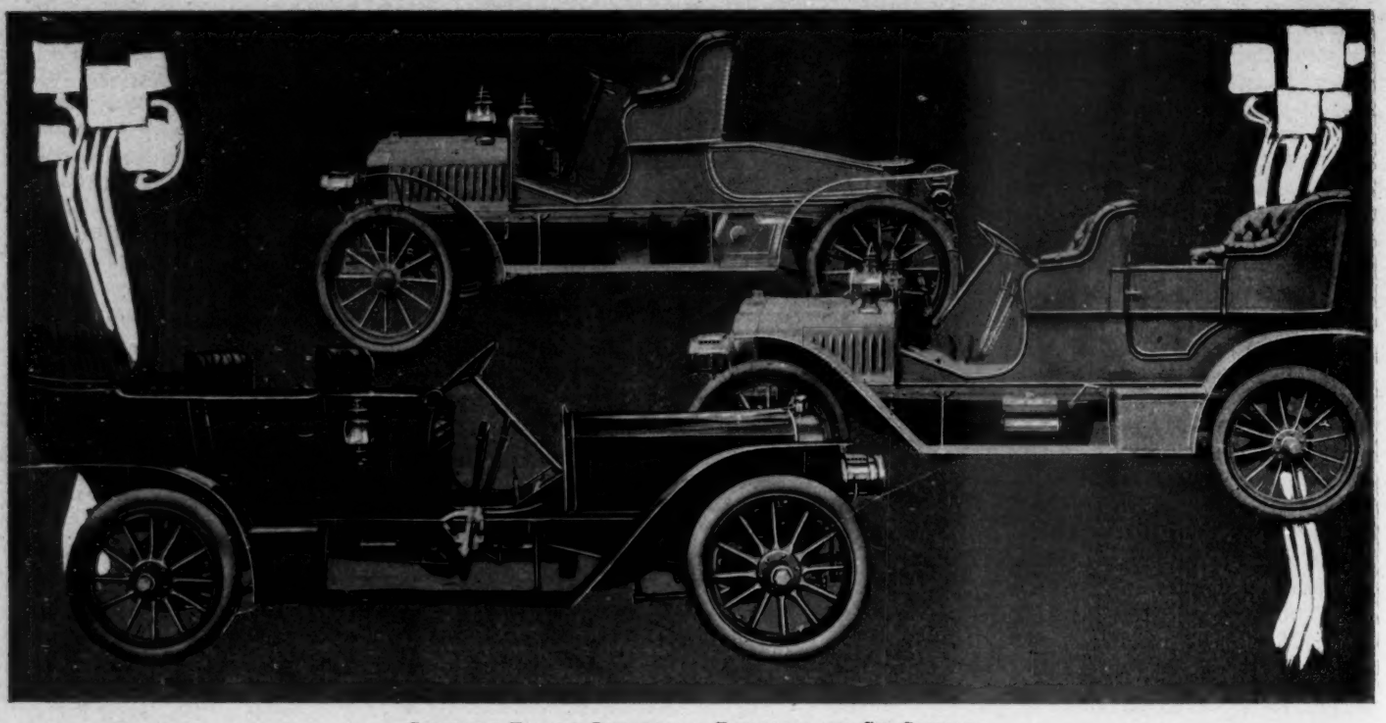
The G. H. Curtiss Mfg. Co. shows a line of airship motors, consisting of a one, two, four and eight-cylinder of 3, 7, 15 and 30 horsepower, respectively. These are found in the aerial exhibit. Two coils are used on the double engine, but on the four and eight a distributer and single coil ignite the charges. A new Curtiss carbureter is fitted and the weights of the motors run at 40, 50, 100 and 140 pounds, all air-cooled and with automatic inlet valves. The single and double-cylinder motors are used by aeronauts.

**White Co.—White Steamer**

Exhibited under the new firm name, the White steamers form the most imposing group of cars exhibited, seven in all, and of two models five are the new model G machines with 30-horsepower motors and two are H models with 20-horsepower motors. Dissected, this list shows the G steamers to consist of a Pullman-bodied car, a touring car, a runabout with rumble seat, a limousine and an extension landaulet, while the H models are a touring car and a limousine. In external appearance the H and G machines are similar, both carrying the same general lines as in the 1906

TWO OF ENGLISH DAIMLER LINE ON PARADE

steamers. The fundamental features of the White system are retained in both and a number of marked improvements are added. Most important of these is the change in the system of regulation in which the thermostat, instead of controlling the fuel supply as formerly, now controls an auxiliary water supply. The main water supply enters the generator by way of a new device called the flow regulator, but the water regulator is the same as heretofore. The action and interaction of these two devices is such that the steam pressure never rises above or falls below, to an appreciable extent, 600 pounds to the square inch, the normal working pressure. Another new feature is the feed water heater, a common device in steam power plants but one not before embodied in White steamers. The new G, a 30-horsepower car with extra motor power, calls for a larger generator,

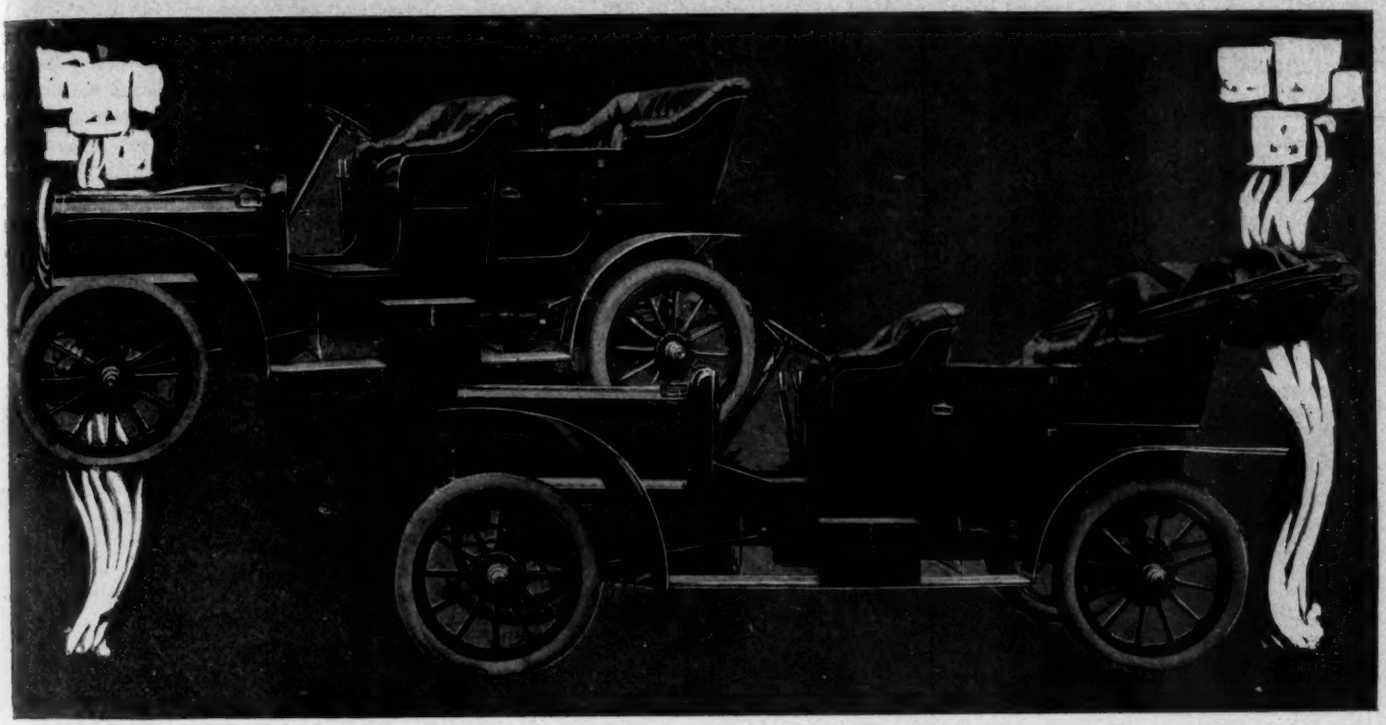


COMPOUND FAMILY, INCLUDING A RUNABOUT AND SIX-CYLINDER

the internal diameter of its tubing being ½-inch in diameter, while that in the small car is ⅝-inch. The chief change in the engine is that there is now a piston valve on the high pressure cylinder, while the low pressure cylinder is provided with a slide valve as formerly. The high pressure one has a 3-inch bore, the low pressure cylinder a 6-inch bore, and both have a 4½-inch stroke, longer than formerly. There are two pumps for supplying water to the generator, driven from an eccentric on the crankshaft by a rocker arm, and on the other side of the engine is another set of pumps, the upper supplying air to the fuel tank and the lower returning the water from the tank to the condenser. In the new system of regulation a diaphragm water regulator is used by which when the steam pressure exceeds 600 pounds the water is by-passed aside from the generator back to the tank. This is the same as formerly, but here a change begins. From the water pumps there are two separate and distinct ways for the water to reach the generator. That to be first considered is termed the flow regulator and performs two distinct functions—it will permit only a certain quantity of water to pass through it; that is, once it is set to allow a certain flow by no means can water be forced through it at a faster rate. Its second function is to open and close the gasoline supply to the burner, which is done by the water forcing down a piston against the tension of a spring, the motion of the piston being used to open the gasoline line to the burner. When water stops flowing through the flow regulator, the piston is no longer under pressure and the action of the spring returns the piston, shutting off the gasoline supply to the burner, which takes place when the motor stops or the steam pressure exceeds 600 pounds. When the steam pressure is below 600 pounds water is passing into the generator part of it through the flow regulator, and so the pressure acts on the piston and the gasoline supply to the burner is opened. So far only one of the two paths for water to reach the generator has been considered. The other path is by way of the thermostat, which in previous models controlled the fuel supply, but in the new machines controls the auxiliary water supply. The flow regulator, it will be recalled, will only permit a limited amount of water reaching the generator, which amount is less than the generator is capable of vaporizing. At such a time the steam pressure will fall off and the steam temperature will exceed the normal because the fire will remain on, but at this time the thermostat acts, permitting water direct from the pumps to enter the generator, water then coming to the generator through both paths. Instantly the pressure will return to 600 pounds, when the automatic fuel and water control will act. The burner is of increased capacity, but otherwise unchanged. The pilot light position is altered, being now on the edge of the burner near the frame, where it is more accessible. By loosening one nut the entire pilot light core can be removed. The gasoline tank now is suspended between the frame pieces at the rear, where it is several inches above the lowest part of the chassis. The water tank is no longer on the dash, but is carried under the floor at the left side of the car. A feed water heater consists of a coil of piping located in the exhaust pipe, the water being heated by the exhaust. The condenser is very much larger and in the rear of it is a large four-blade fan. The model H cars use the improved regulation system, as described; but aside from these are the same as present model F steamers, except the rear location of the fuel tank, the new pilot light, and the reducing of the wheelbase to 102 inches. The rear seat has been widened 4 inches in these new models.

### E. H. V. Co.—Compound

Stored in this exhibit space are five cars, all fitted with compound motors of the type manufactured by this concern for several years. These vehicles are: 16-horsepower runabout, 16-horsepower doctor's stanhope, 16-horsepower touring car, 20-horsepower touring car and 40-horsepower touring car, with six-cylinder motor. The 20-horsepower car is a new machine and introduces in its construction such differences as chain-drive and Hess-Bright bearings for the wheels and end bearings of the motor. Its connecting rods are 3 inches longer than those used in previous models and the half-time gears, instead of being carried within the crankcase, are now housed in a seperate compartment at the forward end. The water pump is now carried on the side and is driven by a separate gear. The wheelbase of this model is 96 inches. It has a pressed steel frame and carries 30-inch by 3½-inch tires. All three of the 16-horsepower models are practically the same as when last exhibited. The innovation at this stand and one of the features of the show is the 40-horsepower six-cylinder car, with four high-pressure and two low-pressure cylinders, the former giving 24 and the latter 16 of the rated horsepower. A cold compression of 95 pounds is used in the high-pressure cylinders. These six cylinders are formed in two castings, three cylinders in each set—two high-pressures, with a low-pressure between them. The diameter of the high-



THE LITTLE MOLINE AND THE BIG MOLINE, FROM MOLINE, ILL.

pressure cylinder is 4 inches, that of the low 7¼ inches, and the stroke of each 4½ inches. The crankshaft has seven bearings, two at the ends and one between each two adjacent cylinders. The throws on this shaft are at 180 degrees, the high-pressure cylinders in each set being mounted together, and at 180 degrees from the low-pressure cylinder. In ordinary service the motor operates at a sped of 700 revolutions per minute, but has a maximum speed of 1,100 revolutions per minute. Carried in the flywheel and operating in an oil-tight compartment is a multiple disk clutch of thirty-five plates, all of steel with ground surfaces and sixteen carried on the flywheel and alternated with seventeen others carried on a spider on the transmissionshaft. All of these disks have a diameter of 12 inches, with 3-32-inch thickness. The transmission is of the Aster sliding type, affording four forward speeds, with one for reverse, and has all of its shafts carried on Hess-Bright balls. Final drive is by side chain. The braking system consists of a band brake acting on the transmissionshaft and used for regular running, and emergency brakes carried on the rear hubs, the latter, when applied, disengaging the clutch. This car has tubular axles in front and rear, full elliptic rear springs, jump spark ignition, with current furnished by storage cells and dynamo and 115-inch wheelbase, 34-inch by 4-inch tires and Hess-Bright bearings for the wheels and jackshaft. The body has capacity for seven passengers, two carried on revolving seats in the tonneau.

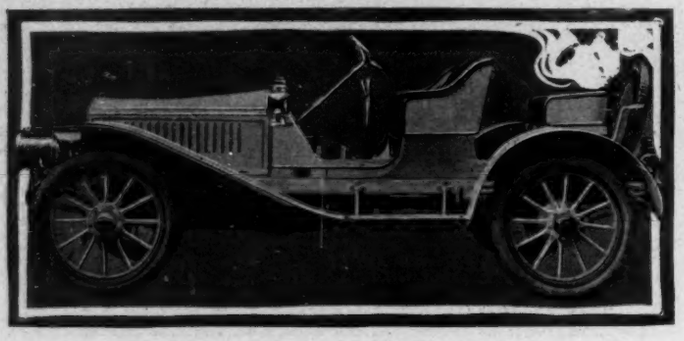
**Delahaye and Pilain Agency—Delahaye and Pilain**

This combined exhibit of two well-known French cars that have been but little in evidence before in this country has on view a 25-35-horsepower landaulet, also a chassis of the same horsepower and a limousine in 45-60-horsepower, all of the Delahaye type, and a 20-35-horsepower Pilain chassis. In the Delahaye cars the motor is made up of single cylinder castings with inlet valves on the right and exhausts on the left. The leather-faced cone clutch is used, but there is a novelty in the manner of attaching the leather. Instead of riveting this to the cone it is held by a number of binding rods that draw the leather down into corresponding depressions in the cone face. The drive is through a four-speed and reverse gearbox with selective sliding gear, then by short propeller shaft to a differential on a cross shaft independently hung below the frame, and from this by side chains to the rear wheels. The change gear hand lever, while working through selected gears, does not pass through an H quadrant, but over a progressive notched quadrant. This is accomplished by swinging the hand lever either into an outer or an inner upwardly extending arm, each with open jaws facing one another. The outer one of these arms is on a central solid shaft, while the inner arm is on an outer sleeve shaft. These shafts are connected at the rear end with drag rods, in turn connected with the clutch slide for its corresponding gear outfit. For any of the gears the lever is thrown into its necessary jaw, which is then rocked forward or back as the case may be. All cars are equipped with magneto high tension and with commutator and jump spark. Magneto and the water pump are each separately driven by a gear connection with the two camshafts. The carbureter is waterjacketed, as is also the exhaust. The water heads on the cylinders are brass plates screwed into place. The Pilain is a car of several novelties in its drive. The gearcase is placed just forward of the rear axle and carries its differential in a rear extension with a short cross shaft. Each end of this cross shaft has a ball and socket joint just outside the wall of the case. From each socket runs a short shaft having a ball and socket joint at its other end, near the road wheel. This end finishes in a spur pinion that meshes with a spur gear on its corresponding hub. The point made by the designers is that this gives great flexibility of drive and eliminates all dangers of breakage, no matter what the service may call upon it to do. The gearbox has four speeds and a reverse, operated by means of a single set of sliding gears for the first and second speed, while the third and fourth speed are direct drive. All bearings are of the annular type. The 1907 group will consist of four sizes—an 18-24, a 24-30 special car, made only to order, with bore and stroke to meet the requirements of the French racing rule; a 28-35-horsepower and a 40-60-horsepower. The cylinders in all but the larger size are cast in pairs, the large motor having separately cast cylinders. The clutch is a metal-to-metal disk operating internally by an expanding segment.

**Moline Automobile Co.—Moline**

Two cars, a 30-35-horsepower touring car for five-passenger service, and a 20-horsepower, three-passenger runabout, are shown on the floor in this exhibit. For demonstration work a new model, S, of the 25-horsepower class, is made use of. This new motor is not a radical departure from general Moline principles with its four vertical cylinders cast in pairs with integral water-jackets and mechanical intake and exhaust valves in the bottom

of ports on the left side and opened by direct lifter rods actuated from a single camshaft housed within the top part of the crankcase. A slightly different cam construction is introduced, giving an increase of power. Added to this is the use of higher compression of the gas to be exploded, this resulting in a power augmentation. Combined in the transmission of this model S is a leather-faced cone clutch located in the flywheel of the motor, a sliding gear transmission with both shafts carried on plain bearings and shaft drive to a live rear axle. In this model and also in the 35-horsepower touring car and the runabout, the company has made a general increase in the size of parts with the consequent increase of power. The running gear resembles that of the others in the use of a transverse front spring carried above the axle and shackled to lugs on the upper arm of the



CLEVELAND RUNABOUT WITH RUMBLE SEAT

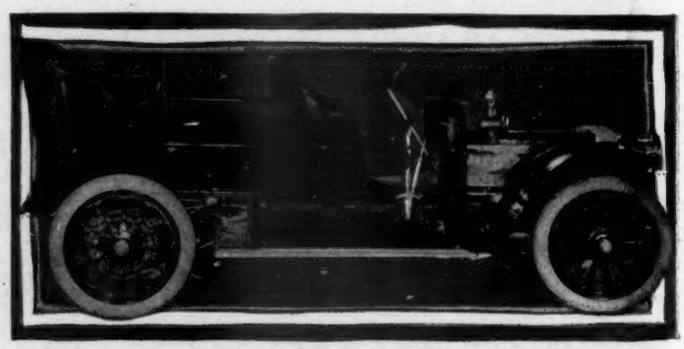
Elliot jaw steering knuckles. The full elliptic rear spring combination is also used, each spring having the scroll ends. A double rear hub brake system includes expanding members within large drums and clamping bands operating on the outer surface of these drums, one set pedal applied and the other brought into action by a lever. A complete Splitdorf ignition system has been installed, with plugs carried over the intake valves and the current taken from storage cells. In coping with the bearing problem nickel babbitt carries the crankshaft and camshaft of the motor. The same material supports both shafts of the transmission set, Hyatt rollers carry the back axle, and ball races are used in the front road wheels. The 30-35-horsepower touring car has not been altered except in the more careful making of the parts, greater care being used in finishing all parts as well as the addition of strength in many places. The wheelbase, wheels, body and springs are as heretofore. The 20-horsepower runabout is the model C of the past summer continued with the runabout body, which follows the general tendency with its sloping front and rear fenders made very long, its brief running board and folding back seat for the chauffeur or mechanic. The color is light gray. The past custom of continuing the bonnet over the sides and top of the radiator remains on this as well as all other models made by the Moline company.

**Cleveland Motor Car Co.—Cleveland**

The 1907 Cleveland, known as model H, still is a 30-35-horsepower machine with many minor changes, all in the nature of refinements, the essential construction of the chassis remaining unchanged. The crankshaft and connecting rod bearings are Parsons' white brass instead of phosphor bronze; oil lever pet cocks in the crankcase show the proper level of the oil; an improvement in the method of filling the crankcase with oil is a copper tube lead over to the exhaust side of the motor, with a funnel at the top; the ignition, essentially the same as at present, has been improved by a new mechanism for advancing and retarding the spark in the make-and-break igniters. Instead of the four rods or bars which carry the arms of the operating cams of the spark advance, a single rotating shaft is substituted. This shaft has four worms 1½ inches long, and the spark advance cam is moved forward and backward by being engaged in these worms. The rotating bar carrying the worms is driven by bevel gears at the rear end, and control is by finger lever on the steering wheel. The eccentric which operates the push rod is notched on its circumference and a spanner is furnished with the tool kit for moving this eccentric, which device is very convenient in timing the ignition. The upper bearing of the vertical shafts are equipped with an oil device, and an oiler also is placed on the lower bearing of these shafts. The flywheel clutch is a leather-faced cone and carries cork inserts. Front springs are secured to the axle by drop-forged saddles of peculiar construction, the rigidity of which is claimed to be a good guard against spring breakage. Increased lubrication facilities are provided for the steering gear; the rear brake is 2 inches larger in diameter and has a face ½-inch wider. An improvement is added in the expansion system. The torsion lever buffer into which the forward end of the torsion rod fits is heavier and is more rigidly secured to a cross piece of the car frame, and the steering wheel is made of solid mahogany. A resumé of the chassis specifications reveals the following facts: Weight, 2,400 pounds; wheelbase, 104 inches; tires, 34 by 4 and 4½ inches; brakes on transmission and rear wheel drums, 30-35-horsepower motor with 4½ by 5¼-inch cylinders, having valves on opposite sides, and shaft drive.

**Evansville Automobile Co.—Evansville**

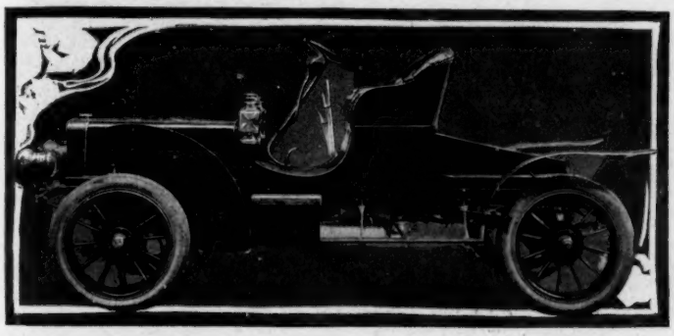
In the model C car and the stripped chassis, shown by the Evansville company, the friction style of transmission used this year is retained in improved form. As readers of Motor Age are aware, this transmission includes two large friction disks on a continuation of the crankshaft, these disks taking the place of a flywheel. A cross shaft between these disks carries a couple of friction wheels, one of which contacts with the forward disk for speeds ahead and the other with the rear disk, and vice versa when reversing. Drive from the cross shaft is by side chain. The friction disks are made with a diameter of 27 inches and are cast iron faced with mineral tanned leather attached to the disk surface by glueing and a double circle of copper rivets. These disks are well reinforced on their rear surface by deep radial ribs. The friction wheels on the cross shaft have been increased in diameter from 14 to 17 inches, giving the cross shaft a slower rotation with reference to the crank shaft and calling for a smaller gear reduction on the chain sprockets. In changing speeds a couple of operations are required — one sliding the friction wheels on their shafts to give speed variations, which is done by a small wheel on the top of the steering column immediately



MASSIVE ENGLISH DAIMLER TOURING CAR

beneath the steering wheel. The engagement of the friction wheels on the surface of the disks is by side lever, the forward movement being for the engagement for driving ahead, a back movement being needed when reversing. The double radius rod scheme is standard, with side rods from the back axle housing to the bearing brackets of the cross shaft. This cross shaft is two shafts in reality—a right half and a left half shaft—in the same horizontal plane as the continuation of the crankshaft and at right angles to it. The inner ends of these cross shafts are provided with a universal support on a yoke spanning the crankshaft continuation. At their outer end is a ball and socket roller bearing support, these joints allowing of carrying the shaft to the front and rear for engagement with the friction disks. The motor employed is rated at 40 horsepower and has four vertical

cylinders with 4½ and 5¾-inch bore and stroke respectively. Valves are on one side in the bottom of integral parts, requiring but a single camshaft. A change has been made in the valve life, resulting in an increase of power over the present motor. No change has been made in the central support scheme, which consists of one support at each side of the motor at a point opposite the center of the crankcase, the motor balancing on this support and held from tilting front or rear by a bearing on the continued crankshaft at the rear end of the crankcase. In the fuel system an auxiliary dash tank is used. Fuel is forced from the main gasoline tank on the back of the chassis by air pressure to this tank on the dash in which is a float device, shutting off the supply from the main tank by a float and the floating connection opening again immediately the supply



GLIDE RUNABOUT WITH GRACEFUL LINES

in the dash tank is reduced. By this scheme there is always a supply in the dash tank for gravity feed, thereby eliminating the necessity of using the air pump for giving more pressure when starting the motor. The governor and commutator are both on the rear end of the camshaft, the former acting on the throttle valve of the Schebler carbureter. In the running gear the back springs are now thrown directly beneath the frame side pieces and the cables for applying the back hub brakes have been succeeded by rod connections. The bearing system includes ball races for all four road wheels, Parsons white bronze for the motor shafts, and roller bearings for the cross shaft of the transmission.

**Woods Motor Vehicle Co.—Woods**

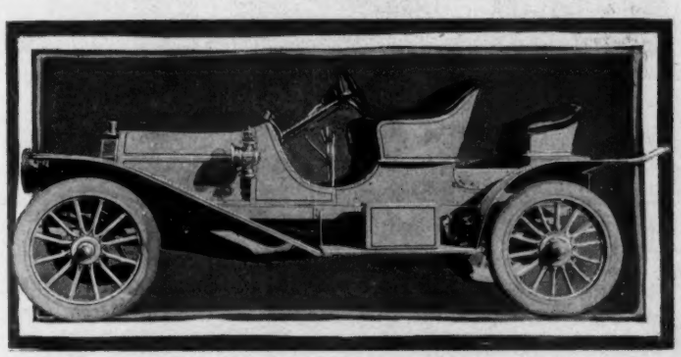
The Woods touring car exhibited for the first time in the east is shown with practically the same power plant and running gear as when last seen at the Coliseum show, Chicago, in February. The 40-horsepower Rutenber motor with 5 by 5-inch cylinders has not been altered, except for the addition of a high-tension Bosch magneto which furnishes the igniting current, previously supplied by storage batteries. Other points remaining as formerly are the cone clutch, sliding gearset, side chain drive, 120-inch wheelbase, 36 by 4½ inch tires and stationary axles throughout. Noted in the exhibit are one touring body with Victoria leather top and a similar body with brougham top, also a tonneau car and limousine. The Woods electrics have not been materially changed, they still being made with Hess-Bright bearings throughout, together with chrome nickel steel axles, a metal liberally used in the gasoline car.

**Milton H. Schnader—Rivieria**

The Rivieria gasoline car fitted with a 20-horsepower two-cylinder opposed motor carried crosswise in front is one more example of the many low-priced machines using this style of motor in place of the opposed style of motor placed longitudinally amidship. The drive is through a two-speed planetary gearset and shaft. Ignition carburetion and lubrication are along accepted lines. The wheelbase measures 106 inches, tires are 32 by 4 inches, the frame work is of pressed steel, the weight 1,900 pounds and a double set of brakes is carried on the rear wheel hubs. In the running gear nothing attracts attention equal to that of the novel spring suspension which gives a three-point support in front and a similar one in rear. The spring scheme is a combination of long flat leaf springs supported by spiral springs, the result gained being such as to warrant the use of cushioned tires on all four wheels. Along each side of the car in front is a leaf spring 46 inches long supported on the car frame near its middle and connecting at its front ends with a cross spring and supported at its rear end on a 9-inch vertical coil spring. The side rear springs are 56 inches long and at their back ends shackle to a cross spring and are also supported by a vertical coil spring above it and another beneath it, while at the front end of the spring is another supporting coil spring.

**Smith Automobile Co.—Smith**

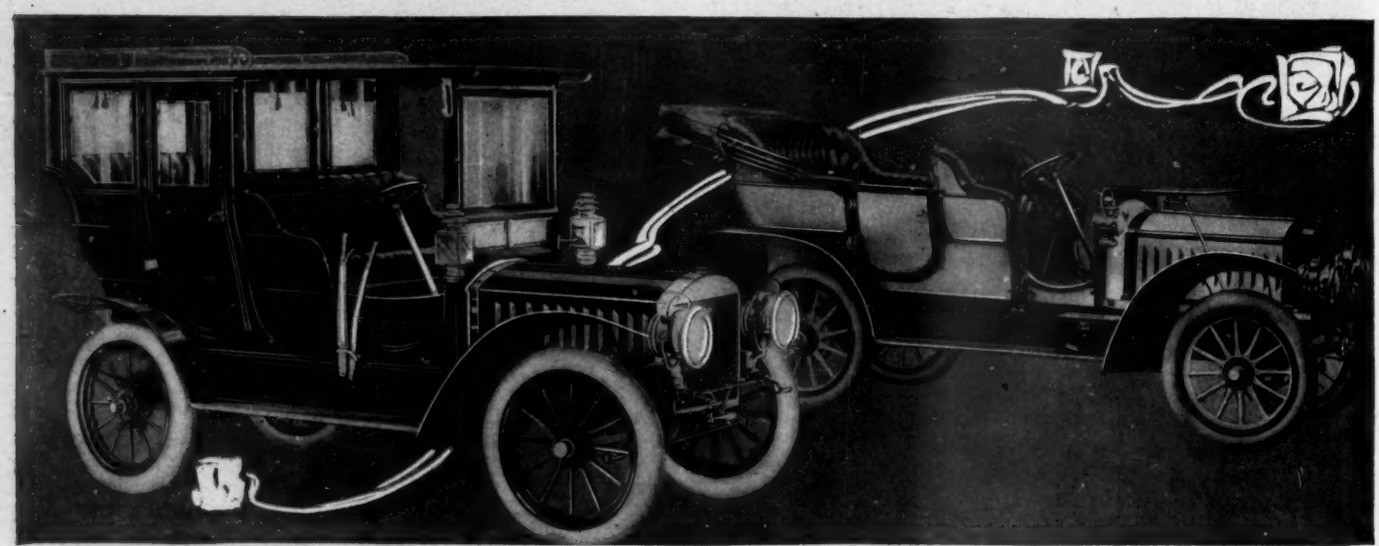
The Smith car, seen for the first time at a New York show, is a five-passenger 24-horsepower machine, with 4½ and 5-inch cylinders, each a separate casting, with intake valves on one side and exhausts opposite, this disposition necessitating the use of a couple of camshafts, both inclosed in the top half of the crankcase and driven by forward half-time gears. The car possesses many novelties, one of the first being the quick method of valve removal. Each push rod raising through the top of the crankcase carries on its upper end a horizontal foot. On the end of this rests the lower end of the lifter rod, which rod bears upon the bottom of the valve stem. By this construction the valve stem is offset 1¼ inches from the center of the push rod, and in removing a valve it is only necessary to loosen a screw holding the horizontal foot on the push rod and turn the foot through a part revolution, when the lift rod can be pushed out of position and the valve removed. The carburation system includes a concentric float carbureter in which the nozzle rests in the center of a basis of gasoline. The inrushing air strikes upon this surface at one side and passing through a horse-shoe shaped piping, exits at the opposite side laden with gasoline. The entrance of fuel to the float chamber is controlled by ball valve operated by the float. The second special feature in the motor is the four-feed mechanical lubricator carried above the cylinder heads between the second and third cylinders and driven by ratchet connection from the camshaft. This oiler is a vertical cylindrical chamber with 2-pint capacity, and in the bottom is a horizontal rotating shaft with four semi-spherical depressions in one side of it. This shaft is a ground fit in a casing, from the bottom of which depart four leads, each registering with one of the semi-spherical depressions of



STODDARD-DAYTON'S GENTLEMAN'S ROADSTER

the shaft. As the shaft revolves the oil fills these depressions and when the shaft has gone through half a revolution these depressions are then downward and the oil falls by gravity from them and is forced through the leads to the four cylinders. This car is one example of unit construction in that the multiple disk clutch is encased in the front of a chamber containing the sliding gearset. Right here it is essential to remember that this sliding gearset, together with the housing inclosing the drive shaft to the back axle and the rear housing, are all secured rigidly together, forming in short a unit construction and a system in which there is not a single universal joint, the only joint of this character being between the motor flywheel and the forward end of the clutch and gear housing, at which point there is a ball support for the housing. The clutch

has twenty-three disks, eleven of them of bronze carried on the flywheel and alternating with the twelve steel disks supported on a spider on the transmission shafts, all of these disks having a diameter of 7 inches and a thickness of approximately $\frac{1}{16}$ inch. The gearset is of the standard sliding construction, with main and counter shaft in the same horizontal plane, but a conspicuous feature of it is an inter-connection between the shifting gears and the clutch, making it impossible to shift gears with a clutch in mesh and also rendering it possible to shift without resorting to the use of the clutch pedal, the inter-connection being such that on pulling the gear shifter level the clutch is automatically thrown out, after which the gears are properly meshed, when the clutch immediately takes hold again. The gear housing and shaft housing are supported by a triangular brace system, consisting of a pair of radius rods attached to the ends of the axle housing and converging at the forward end of the shaft housing, where they unite with a collar clamped on the shaft housing. Not to be passed over is the use of a three-point suspension for the motor, a differential 1 inch wider than most standard constructions and the use of cone clutch brakes on the back wheels, these brakes operating identically with those of a cone clutch on the fly-wheel. There is also a telescopic steering column, which has a 7¾-inch telescope, with a set screw for anchoring it at any point. The car has a 107-inch wheel base, full elliptic springs in front and rear, a manganese bronze I-beam front axle and Timken bearings throughout its transmission system.



LIMOUSINE AND TOURING CAR SHOWN BY AUSTIN PEOPLE

**Acme Motor Car Co.—Acme**

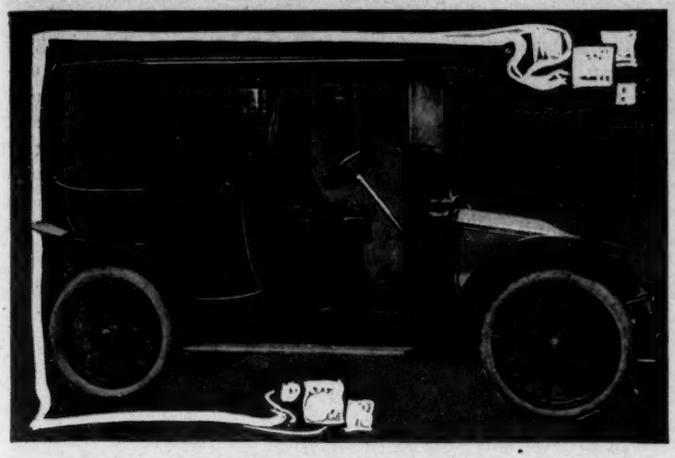
Three cars shown by this concern are limousine, touring car and runabout. But few changes are shown as compared with the last show at which these cars were seen. The regular and emergency brakes are now carried on the rear wheel hubs, one set expanding within the hubs and the other clamping on these same drums. The wheel measurement has been increased from 34 to 36 inches and in the ignition system an Eisemann high-tension magneto takes the place of the storage cells, coil and commutators formerly used. The 50-horsepower motor has separately-cast cylinders with integral jackets and opposite valves. Added to these are cone clutch, selective transmission and double chain drive. Its wheelbase is 115½ inches, its clearance 10 inches and its weight 2,600 pounds. The runabout and limousine have chassis of the same general construction.

**R. Bertelli & Co.—Zust**

The Zust car, which is shown by R. Bertelli & Co. for the second time in this country, is displayed in one model, a 40-45 horsepower, there being two cars on view, one with a touring body and the other a polished chassis. The water plate cap in the cylinder heads, shown on last year's model, has been dispensed with, the waterjacket being carried entirely over the top of the double cylinder, with a decided dome shape for each cylinder, giving it a very distinct appearance at this point. The other changes noted from last years' exhibit is that a pedal throttle is equipped in connection with the carbureter; the cross shaft for the double chain drive has two hand brakes, one on either side of the gearcase; the pushrods on the selective gears are now enclosed in an extension running forward from the crankcase to an upper aluminum casting that surrounds the drop lever from the cross shaft. Other changes around the engine are that the pump is now driven by a separate shaft underneath the magneto instead of by the same shaft that last year drove the magneto. The oiler on the dashboard is now driven by a pushrod instead of by a belt. The carbureter is jacketed for hot water and the valves are now lifted direct by the cams instead of by an interposing short lever. On the whole, the motor is somewhat shorter, giving a more compact construction under the bonnet. As last year, the flywheel is cast with fan blades and contains in its hub extension a multiple disk clutch made up of fifty thin steel plates. The transmission has four forward speeds and a reverse and is of the selective type with gate quadrant. In the gearbox is the differential for the cross shaft carrying the double brakes, which are additional to those in the rear hubs. Water circulation is by gear-driven pump and honeycomb radiator without fan between radiator and engine. Ignition is by low tension Simms-Bosch magneto, the make-and-break being conveniently located on the cylinder heads. The tappet rods for the ignition are driven by a camshaft on the right of the motor, the valve camshaft being on the left, where are placed all the valves. A low dash following the curvature of the bonnet, together with a sharp upward sloping to board, gives a rakish appearance to the car.

**Italia Import Co.—Itala**

Three Itala cars are shown, there being a 35-horsepower touring car and a limousine of the same power and a 60-horsepower touring car. Construction is alike in both sizes, the difference being merely in the cylinder bore and stroke. In the 35-horsepower engine the bore is 5⅛ inches and the stroke 5⅛ inches. In the 60-horsepower the bore is 6⅛ inches with a shorter stroke, that being 5⅛ inches. Cylinders are cast in pairs with opposite valves. The waterheads of the cylinders are inclosed with a full water cap of iron, with a slightly crowned top. The valves are lifted by rockers working between the cams on the shafts and the push rods. The make-and-break ignition differs from the usual method used at this point. Instead of a push rod for each cylinder, there is a vertical worm-driven shaft for each pair of cylinders. At its upper end this shaft carries a



VISITOR FROM FRANCE—THE RENAULT

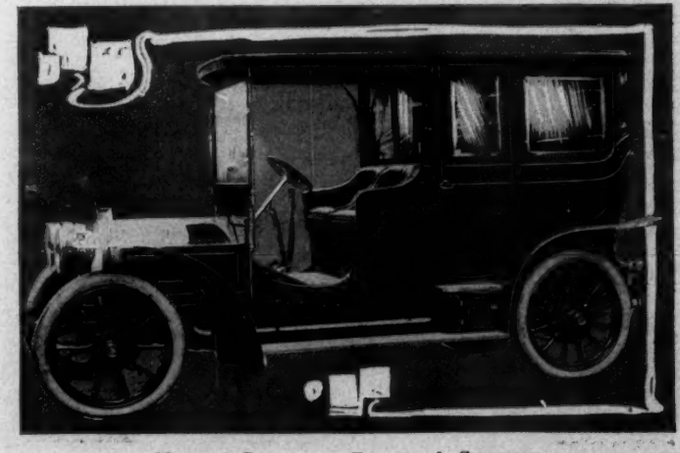
double cam, one of which works the ignitor on one cylinder and the other the ignitor on the mating cylinder. The magneto is driven on a separate shaft, cross-geared to the intake camshaft. The water pump is similarly driven on the exhaust side of the motor. There is but one wire on the entire car, this being a short length from the magneto to the forward end of the buss bar on the front cylinder. A sliding buss bar runs to the second cylinder and from here it is connected to a buss bar on the two rear cylinders by a helical spring. The intake valves are placed on the right and the exhausts on the left. Lubrication is by a mechanically-driven feed, but not of the force type. This feed box is on the rear of the dash and has a chain running over an upper and lower sprocket. At intervals on this chain are side buckets which pass down through the oil and then up again, and as they turn to make their return trip they unload a fixed quantity of oil into two troughs which lead to the various feeds. The device is easily understood if one is familiar with the old time chain bucket well. The carbureter is differently positioned than is usual, it being placed so its two side feed pipes lead one to the rear of the front valve house and the other to the front of the rear valve house. In other words, the gas enters the valve houses at their ends instead of at their sides. Gasoline tank is carried at the rear and supplies the carbureter by pressure. The drive is through a four-speed and reverse selective gear box with shaft and floating rear axle. In addition to the accelerator at the toe-board there are three foot pedals, one of which operates the clutch. Each of the other two foot pedals is independently connected to a brake on the through drive. The drum for one of these brakes is forward of the gearcase and that for the other is at the rear of the gearcase and each drum is water-cooled on the inside, the feed valve opening automatically as the brake is applied. The water for this service is carried in its own tank, fed from the side of the car. The differential carries a ratchet sprag.

**Abendroth & Root Mfg. Co.—Frontenac**

Both Frontenac cars exhibited in this stand have the same chassis with identical motor, clutch, transmission, brake and other systems. One car is a five-passenger machine and the other a runabout carrying a very smart and interesting body. The motor, of the four-cylinder, vertical class, has a rating of 40-45 horsepower and has cylinders cast in pairs with integral heads and waterjackets and the mechanical valves located in the bottom of ports on the right side. The motor in general respects follows accepted lines of construction and has a Splitdorf high tenscion magneto system and another system with current coming from storage cells. A specially neat arrangement of the parts is made possible by having an additional shaft on the left side, which drives the water pump, located opposite the space between the cylinder pairs, and also driving the magneto, carried well to the rear on the motor bed. On the forward end of this shaft is a large pulley from which the fan is driven by a flat belt. All half-time gears are enclosed in a separate compartment at the front end of the motor. Of interest in the transmission is the use of a multiple ring clutch fashioned largely after the design of multiple disk clutches excepting that flat rings take the place of the disks. Five rings are needed—two bronze rings secured to the motor flywheel and three with which these alternate, carried on a spider on the transmission shaft. The latter three are of steel. These disks have a diameter of approximately 14 inches and a radial thickness of 2 inches. Engagement is by hub spring. Changes in speed are made through a selective design of gearset giving three speeds ahead and one for reversing, and in this gearset the main and counter shaft are in the same vertical plane with the main shaft underneath. In changing speeds a single lever at the right end of the footboard suffices. It works in a one-slot quadrant. The lever has the usual top push button and in its vertical position the gears are neutral. To get first speed ahead—direct drive—the lever is pushed forward without using the button, and for intermediate it is pulled back. For slow speed and reverse the button is pressed, after which the lever is pushed ahead for slow speed and drawn back for reverse. The lower end of the change speed lever is by the latch locked to a couple of short levers, one at its right side and the other at its left. These levers are in turn mounted on a cross shaft with tube surrounding the shaft, the tube having connection with one of the shifter rods to the gear box and the sleeve having connection with the other shifter rod. Drive from the gearset is by shaft with a couple of universal joints and supported by two torsion rods, one at either side, and each made stationary at its rear end in the differential housing and with pivotal connection at its front end on a cross piece of the car frame. The motor bearings are bronze, and balls are used for both shafts in the gearset, as are they in the rear axle and front road wheels. The wheelbase measures 123 inches; tires on the runabout are 34 by 3½ and 4½ and on the touring car the tires measure 34 by 4 and 4½ inches in front and rear respectively. Springs in front and rear are semi-elliptic, the front pair 42 inches long and the back pair 52 inches. The runabout body follows that style so common this summer, with a long rakish bonnet, sloping fenders and folding rear seat for the mechanic. The dash is a novelty, being very deep from front to rear and forming a large baggage space where tools and other equipment can be carried, leaving the running boards and back platform free of encumbrances. Having a deep dash places the seat well back towards the rear axle, lends additional incline to the steering column and makes the front fenders proportionately longer. A double system of brakes acting in the rear hubs is used in both machines.

**Lane Motor Vehicle Co.—Lane**

Nothing radical in change of design has been attempted in the Lane steam car, which is shown with a couple of styles of bodies, both mounted on the same type of chassis. These cars have that accepted power layout with the boiler carried in front beneath the bonnet, the motor inclined at an angle of 18 degrees to the horizontal and carried beneath the footboard of the car, and with drive to the back axle by single chain. The motor,



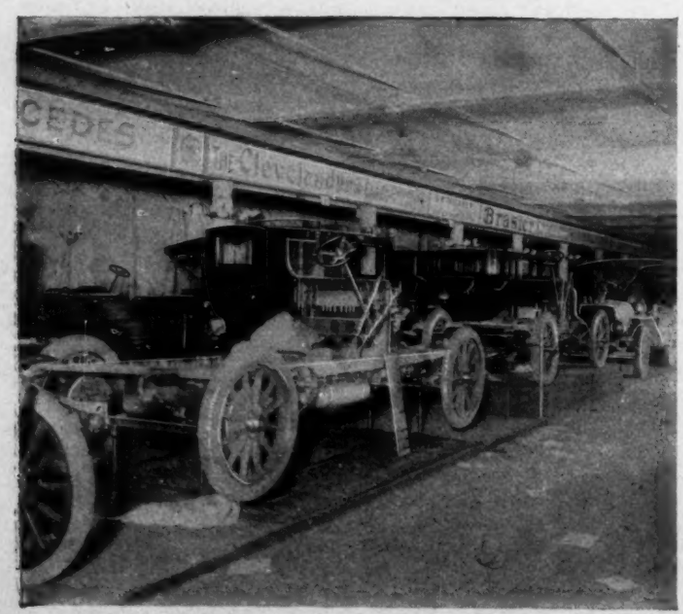
MARTINI SHOWN BY PALMER & CHRISTIE

GLANCING VIEW AT THE MARMON

with its two 3¼ by 5¼-inch cylinders with 3½-inch stroke, gives 15 horsepower when working as a compound engine and 22 horsepower when simplified. The boiler plant is a combination coil and tube, one with the water first entering the coil portion and receiving a considerable superheat before passing to the motor. The only alterations noted in the motor are the use of a heavier crankshaft, using ball bearings in the cross head, and a few minor changes of form. The water capacity is 20 gallons, fuel capacity 17 gallons and consumption from 7 to 10 miles per gallon of gasoline. The body and control parts remain the same as was made by the company for this year's business.

**Palmer & Christie—Martini**

The Martini is shown in four 24-horsepower chassis, with a runabout drop rumble seat, a landau, a limousine and a touring car body respectively; also in a 40-horsepower chassis, ready for the body. In general the car maintains the same features as used this year, but a somewhat radical departure is in the type of clutch. The expanding metal-to-metal clutch heretofore used is to be replaced in the 1907 cars by a leather-faced cone clutch. In the 50-55 model, which is not on view, a change will also be made by increasing the bore and stroke ⅛-inch in each instance. Next year's cars will have the front spring hung so its greatest length is forward of the axle seat. The engine continues to have four cylinders, cast in pairs, with oppositely disposed valve heads. The gearbox is well back in the frame and has four speeds and reverse, selective type, with cross shaft and outside chain drive. The full underpan for the power plant is continued. Ignition is by make-and-break low-tension magneto controlled by a lever back of the dashboard, which operates a flat bar, running over the intake valve heads, with sloping slots that govern the time of ignition. Gasoline is fed by pressure and water circulation is by gear-driven pump. Lubrication is through a sight feed on the dash by means of pressure feed, with leads to all four cylinders and the main bearings.



MERCEDES AND CLEVELAND RUB ELBOWS

**De Luxe Motor Car Co.—De Luxe**

To enumerate the many features of the new 50-60-horsepower De Luxe car and enter into detailed description of its many interesting features is impossible in a brief show resume. Its motor—four vertical cylinders cast in pairs—uses copper waterjackets, one jacket for each cylinder pair; and both intake and exhaust valves are carried in the cylinder heads inclined outward at an angle of 20 degrees to the vertical, both operated from one camshaft with a single rocker arm for opening the intake and exhaust valve on each cylinder. In doing this a compound cam is required with a large-diameter part for raising the lifter rod for opening the exhaust valve and a depressed portion into which the lifter rod can drop and at which time the action of its coil spring on the lifter rod forces it downward, bringing the other end of the rocker arm against the intake valve stem and opening it through the tension of the spring already mentioned. The four rocker arms as well as the lifter rods are of chrome nickel steel and through adjustments at the top of the lifter rod and the base of the standard supporting the rocker arm, it is possible to adjust the intake valve or exhaust valve timing to any extent. Next in importance in the motor is the use of a ball-bearing chrome nickel steel crankshaft. The shaft taking its support on three races of Hess-Bright balls, eight 1-inch balls in each race and with the diameter of the outer race 8 inches. These balls are carried in the top half of the aluminum case, leaving the lower portion serving as an oil reservoir. In lubricating the motor, two systems are required: one is six-feed Lunkenheimer oiler sending a feed to each cylinder and one to the magneto gearcase and another to the clutch; the second system is a hand-plunger pump carried beneath the footboard and connecting with a 1½-gallon oil tank from which oil can be injected direct into either the front or rear halves of the crankcase. Ignition is by a gear-driven Remy high-tension magneto located on the left forward engine bed, with its drive-gear encased in the aluminum housing which encloses the half-time gears at the forward end of the engine. Mixture is furnished by a De Luxe carbureter of a three-spray float feed type, and to facilitate cranking of the motor, a compression relief is used. It takes the form of a priming cup on the side of the combustion chamber, with its top guarded by a hinged valve with limited upward movement and in the base of this priming cup is a valve controlled from a handle at the front of the radiator. With the compression valve open when the cylinders are on the upward stroke, the air freely exits by raising the hinged cap but immediately the suction stroke begins the cap closes, necessitating the motor drawing moisture from the carbureter rather than pure air from the atmosphere. The pistons carry what are known as Westinghouse compression rings, consisting of one split non-eccentric and of triangular cross section, and expanding this ring is another ring of six segments, each segment expanding through a flat spring secured on its inner side. A feature in the radiator, which is of the flat horizontal tube style, is the placing of slight corrugations in the under sides of these tubes so in case of the water freezing there is an opportunity of expansion without the pipes bursting. Transmission is through a cone clutch and selective transmission in which both shafts are carried on Hess-Bright balls. Chrome

nickel steel is used on the gears and shafts. Final drive is by shaft to the combination stationary and live rear axle. The stationary part is an I-beam axle extending from wheel to wheel and on which the entire weight of the car is carried, this axle carrying the wheel bearings at its ends. Resting in the dropped center of this is the differential, its housing being securely fitted to the stationary axle and its driveshafts to the wheels passing through the bored ends of the stationary axle, finally driving the wheels by clutch caps engaging similar clutches on the wheel hubs. The axle has all the advantages of a floating rear axle combined with those of the stationary axle as used in a car with side-chain drive. Hess-Bright bearings are used all through the car except camshafts and connecting rods, there being in all thirty-four races of this type of bearing. The car framework is of channel section with the open part facing the ground. The channel has a depth of 5½ inches, a 1½-inch width and has the lower portions of the channel lips beaded back. The body is of specially attractive lines, with its graceful rising front fenders, its low front and rear seats, lengthy tonneau and easy body curves, and a great deal of friendliness is displayed toward the newcomer.

**Renault Brothers' Selling Agency—Renault**

The Renault cars are shown without changes from this year's models in matters of construction, the only change being in the rating of the larger-sized motor, which for 1907 will be known as 35-45 horsepower in place of 40-50 horsepower. An additional model is shown in a two-cylinder 8-9-horsepower taximeter cab as used in the streets of Paris. The other cars shown comprise a 10-14-horsepower landaulet; a 14-20-horsepower touring car; a 20-30-horsepower brougham and a 35-45-horsepower limousine to seat six inside, five passengers facing forward. All these are four-cylinder cars. The engines are vertical, cast in pairs with valves all on one side. Ignition is by Simms-Bosch high tension magneto direct driven from the motor without hand control, as the point of sparking is predetermined, the only hand lever on the steering wheel being for the gas throttle. Lubrication is by forced feed to all journals, with splash for the cylinders and pistons. Cooling is by thermo-siphon with the radiator continued at the dash and a bladed flywheel acting as the fan for the air draft. An internal cone is used as the clutch at the flywheel connected to the four speeds and reverse transmission with final drive through propeller shaft to the rear axle. The cab engine has a single pair of cylinders, in one casting, of the same bore and stroke as the four cylinders in one casting of the 10-14-horsepower landaulet; that is, 3 inches and 5 inches respectively. The cab comes in two sizes, the overall dimensions of one being 10 feet 7½ inches by 5 feet and of the other 11 feet 6 inches by 5 feet. The length of the body building space in the former is 6 feet 6¾ inches and of the latter 8 feet ½ inch, with the width in each instance 2 feet 8 inches. The wheel bases are 90¼ inches and 100 inches respectively and treads 50 inches. In construction details the cabs are identical with the Renaults which are now in use on the streets of Paris.

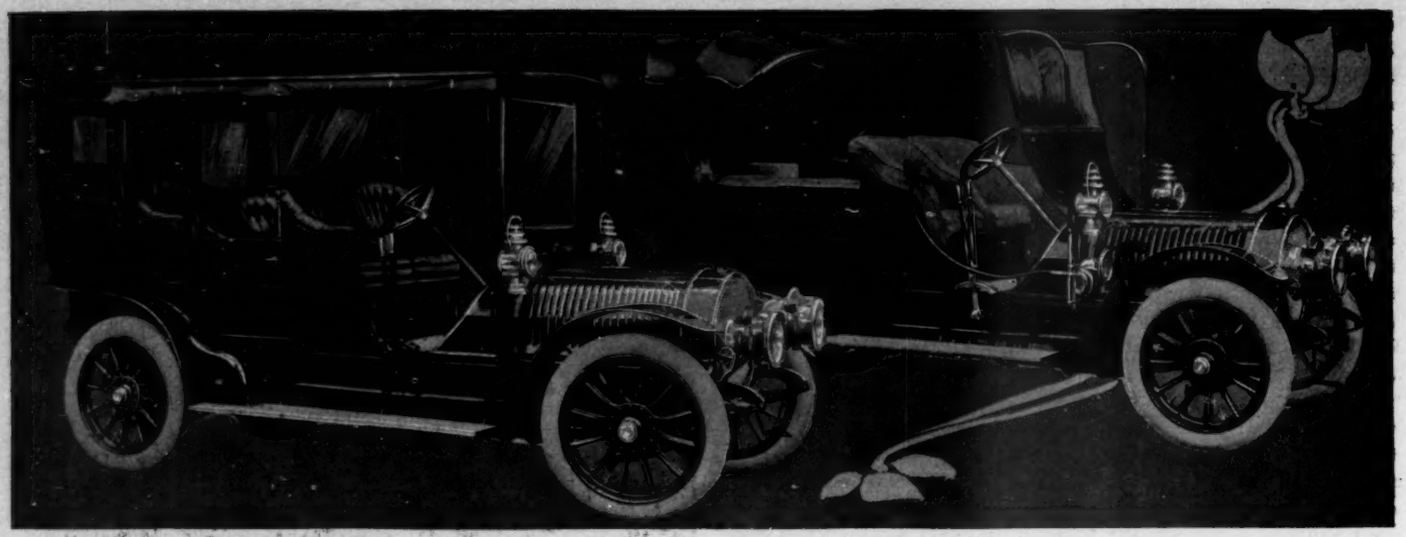
**Hartford Suspension Co.—Gobron-Brillie**

The Gobron-Brillie car, although made in 24-35 and 60-horsepower sizes, is shown in the 35-horsepower size only, because of the limited space at the disposal of the exhibitor. The chassis is mounted with a full limousine body. The Gobron-Brillie has several characteristic constructional features, but of course it is its motor that stands out pre-eminently above its other features. In general the engine has four vertical cylinders cast in pairs, and is of the four-cycle type, with valve housings on opposite sides. Its valves are mechanically operated, but at this point the comparison with our general ideas of what a description of this sort means, ceases. This is due to the fact that the engine has not only the usual pistons but an upper set, together with a connecting rod case for same, which has no crankshaft. The two pistons in each cylinder work in opposite directions, the upper being utilized to take the recoil which on other motors comes against their cylinder heads. These

AEROCAR CHASSIS ON EXHIBITION

upper pistons are coupled together by means of a cross-head at either end of which connecting rods pass through the outer walls of the cylinders direct to the crankshaft, pulling upward. The two lower pistons are connected direct to the crankshaft at 180 degrees and press downward. The effect of this is to give a push and a pull on the crankshaft at each explosion. All gears, cranks, crossheads and crankshaft are enclosed in upper or lower aluminum cases, the upper case having vent caps to ease off the compression. These upper cases also have oil feeds for the upper pistons. The drive from the engine is through a flywheel with blades, that has a double cone for the aluminum cone clutch. This clutch really is a small cone and a large cone all in one, but otherwise is of the usual type. The outer cone is faced with leather, while the cone of smaller diameter works metal-to-metal. The metal clutch is set rather in advance and engages first, doing all the slipping, the outer clutch coming into action afterwards and completing the lock. Final drive is through a four-speed and reverse selective gear case, combining in its rear end the differential gear box for the cross shaft carrying the side chains. Ignition is by accumulator and non-trembling coil worked by a distributor on the magneto and thence direct to the spark plug for one system. For the

CAR DE LUXE MAKES ITS DEBUT AT THE SHOW



DELAUNAY-BELLEVILLE LIMOUSINE AND TOURIST

other, there are two systems employed, a magneto of high tension type, both systems being Eisemann's. Water circulation is by a gear-driven rotary pump and tubular radiator with a belt-driven fan between the radiator and engine, in addition to the fan blades on the flywheel. Lubrication is by forced feed, the pump operated by an eccentric off the camshaft. Control is through the usual levers at the center of the steer wheel and a foot pedal at the toe-board. Three foot pedals are used, one for the clutch and one each for the band brakes placed on the cross shaft at either side of the gear box.

**Logan Construction Co.—Logan**

The Logan semi-racer exhibited is practically different in almost every respect from pleasure cars previously exhibited by this firm. Model O, as the car is termed, makes use of a vertical four-cylinder, air-cooled motor carried on a subframe beneath a forward bonnet. The motor is of the Carrico design from the factory of the Speed Changing Pulley Co. Of equal interest in the car is the novel transmission which is housed with the differential in a unit casing in the back axle. Besides housing the transmission here, interest centers in it, as it gives two forward speeds and one for reversing, all of them being direct drive. The differential has a couple of opposing, large bevel gears, one with a single circle of teeth at its periphery and the other with double sets of teeth, one at its periphery and another midway between the periphery and the axle. On the end of the pinion shaft are two bevels, a smaller one meshing constantly with the outer row of teeth on both bevels and the smaller gear constantly meshing with the smaller set of teeth on the one bevel. A double sliding-jaw clutch scheme is used, one between the large bevels on the axle by which either one can be locked to the differential axle and the other on the pinion shaft, by means of which either the small or large pinion can be locked in position. In driving ahead either of the pinions on the pinion shaft can be locked to give low or high speed, and at the same time the bevel gear with the double teeth ring is locked to the differential. In reversing both of these are declutched and the smaller pinion on the pinion shaft and the one large bevel with the single teeth ring locked to their respective shafts on the differential. The rear axle is well trussed. In other respects the car savors of standard lines, having a pressed steel framework with straight side pieces, semi-elliptic springs in front and rear, worm and gear steering, regular and emergency brakes on the rear hubs, and body accommodating two and with sloping rear compartment.

**Welch Motor Car Co.—Welch**

The Welch people show four cars, three four-cylinder machines and a six-cylinder touring car carrying seven passengers. The four-cylinder machines include a detachable limousine, a touring car and a runabout. Each of these carries a Welch four-cylinder motor with cylinders cast in pairs and intake and exhaust valves mounted at an angle in opposite sides of the head, with the valves opened by exterior camshaft carried along the cylinder heads. A few changes noted in these motors are the making of the cams larger, increasing the diameter of the intake and exhaust valves ¼-inch, using a new worm and sector steering gear carried beneath the motor bonnet and with the worm and sector not enclosed, but the sector bearings lubricated by separate leads. A choice is also given of having a three-speed transmission giving a couple of reverse speeds or a two-forward speed set with a single reverse. The wheelbase has been lengthened from 119 to 126 inches and the wheels are 36 by 4½ inches. An option is given of high-tension magneto or storage cells for supplying the ignition current. The six-cylinder car is a four-cylinder machine with two more cylinders added, meaning an increase of 50 per cent of motor power, placing these figures at 75. The motor design is identical with that of the four-cylinder cars, and the transmission gives three speeds forward and a couple of reverse speeds. This transmission set has three shafts, all carried side by side in the same horizontal plane with the direct drive shaft in the center and that for the two reverse speeds and slow speed at the left, and with the second speed shaft on the right side. In this gearset the gears are always in mesh and changes in speed are made by locking different sets of gears to the several shafts, this locking being done by the use of multiple disk clutches within the gearcase. Using this system dispenses with the use of a clutch in the flywheel of the car. Thirty-six by 5-inch tires are regularly used, babbitt and Hess-Bright bearings are fitted in all important places, and the Welch combined cellular radiator with water pump combined with it is retained. Shaft drive rules on all models, as does the use of internal and external hub brakes. The bore and stroke of the cylinders in all models are 4⅝ and 5 inches, respectively. Foot and throttle control are fitted, and provision is made for 18 gallons of gasoline.

**Marion Motor Car Co., Marion, Ind.—Marion**

As a matter of fact, the Marion concern is particularly exploiting the Hassler transmission, which it owns. The company, however, displays a rakish-looking four-cylinder runabout and a chassis, each fitted with this transmission, while a demonstrating car also having the Hassler transmission is in service on the streets. The car shown is of the conventional four-cylinder type, the motor being rated at 24 horsepower, the cylinder dimensions being 4 by 4 inches. High tension ignition is used, the cooling is by water, whereas heretofore the Marion has been air-cooled, and of course the final drive is by propeller shaft. The car has a wheel base of 100 inches and weighs 1,600 pounds. The wheels are 32 inches and the tires 3½ inches. The clutch is of the disk variety, with twenty-nine disks of 16 gauge

TWO WELL KNOWN FOREIGNERS—PANHARD AND BIANCHI

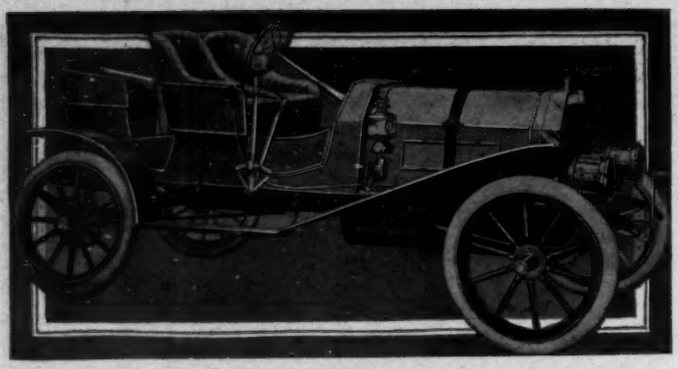
spring steel, fifteen being assembled on the flywheel and fourteen on the clutch shaft. Four spring tongues central on the flywheel disks exert a separating force. The effective friction surface on each face of each disk is given as 7.82 square inches, so that the fifty-six faces present a total of 437.9 square inches. The spring compressing the disks is 7 inches long when free and is contained in a clutch bowl, which contains oil constantly. Both internal and external hub brakes are fitted, being connected by operating shafts that extend across the axle immediately in front of the housing, the necessity for hanging countershafts under the frame to operate the brakes being avoided. Much is claimed for the Hassler transmission, which provides one reverse and two forward speeds, as well as a neutral position. These are obtained by means of a single shaft through the transmission on which the gears slide. A countershaft transmits power from these gears to the differential case by means of spur gearing. The sliding gears are of four pitch and ball and roller bearings carry the transmission and the differential. The transmission is so made up that the motor shaft may be located on a horizontal plane 5½ inches above the center of the rear axle and still permit the motor shaft and propeller shafts to be on a line. A disk on the countershaft in the transmission carries a circle of pins on its outer periphery, as well as a bevel gear in the center of this circle of pins. These pins are in use only when either the low or reverse positions are in use. When the sliding member on the drive shaft extension in the transmission is moved forward and engages the back circle of pins, the power is transmitted through the disk on the end of the shaft and then through the spur gear and the differential to the back axle, giving a reverse motion to the car. The reverse gear is held out of engagement ordinarily by means of a spring. When the sliding member on the shaft is moved out of engagement with the reverse gears and then a little further, it engages the circle of pins on the other side of the disk on the countershaft, thus giving first speed ahead. Then if the sliding member is moved still farther it disengages the circle of pins and engages the gear loose on the shaft but which is constantly in mesh with the inside gear on the disk on the countershaft, thus giving direct drive. The drive shaft is inside a tubular housing, whose radius equals that of the shaft, which is attached to a cross member of the frame by a hinged jaw to allow for misalignment due to spring inequalities. Usually the low and reverse gear ratios are equal and about half the high gear ratio, which may be anything desired by the owner of the car.

### Panhard & Levassor—Panhard

Of the five cars shown three are 1906 models and two are representative of 1907 construction. The 1906 line is made up of a 24-horsepower touring car, a 24-horsepower limousine and a 35-horsepower double phaeton. The limousine is equipped with all the latest fittings that come with cars of this class, such as electric lights, folding tables, etc. The 1907 models are represented by a chassis of 24-horsepower and a 50-70-horsepower chassis. The former has four cylinders and the latter six. There are no constitutional differences between the two, the six-cylinder car merely being a matter of added cylinders. The 1907 models vary but little from those of the present year, there being but three changes. The water circulation is now carried from cylinder to cylinder by an inverted U-shaped pipe instead of by a straight-through run with T branches to the cylinder heads. The magneto, of high tension, and the pump are now on the same shaft, the left, instead of being driven by separate shafts. The cam release for starting is now attached to the forward end of the shaft instead of being carried to the rear end. The distinctly Panhard frame construction is maintained with wood main members supported by flitch plates. The cylinders are continued as separate castings with valves on opposite sides. The drive is a multiple disk clutch made up of two sets of twenty-five plates each, one set being secured by bolts at their outer edges to the flywheel and the other set connected at their inner edges to the shaft of the gearcase. The gearcase is set well back for the short side-chain drive, necessitating a long shaft from clutch to gearbox. In order that the clutch may be readily removed this shaft is made up of three parts, the center one of which is connected to the other two members by large bolt-flanges. The gearbox has four forward and a reverse speed. Ball bearings are used throughout except in the engine. The engine and gearcase are both carried on a subframe supported beneath the main frame cross pieces. The radiator remains of the same general construction, but with a slightly altered outline and shape of bonnet.

### Pennsylvania Automobile Co.—Pennsylvania

This is a new car that is manufactured at Bryn Mawr, a suburb of Philadelphia, and whose claim is that it is built along accepted lines. It has a four-cylinder motor 4½ by 5 inches and is rated at 35 horsepower. It has mechanically-operated valves, cone clutch, three-speed selective gearset and shaft drive. The cooling system consists of a cellular radiator and a gear-driven centrifugal pump. The ignition is by jump spark, a storage battery supplying the current through a four-part coil on the dash. The commutator is of the double-ball contact variety. A Schebler carbureter is used. The frame is of pressed steel and the motor is hung well back, the wheelbase being 111 inches, the tread standard. The frame is supported by 40 by 2-inch semi-elliptic springs in front and platform springs 2 inches wide in the rear. The front axle is drop forged, of I-beam section, while the rear axle construction permits of a floating drive axle being used. The axles are dropped, but give a clearance of 9 inches. The steering gear is of the irreversible order, with internal and



NEW CRAIG-TOLEDO RUNABOUT

external worm and nut. There are two sets of brakes on the rear wheels, internal and external, both being operated by one lever. The car is fitted with 4 by 34-inch wood wheels. The style of the body resembles the Mercedes somewhat, seats five people and weighs 2,550 pounds with a full equipment.

**Bosquet & Co.—Bianchi**

The Bianchi car, which made its appearance in this country last spring, is shown in one model of 20-30-horsepower, although there are two other models made which are expected before the close of the show. The first of these two sizes is a 40-50-horsepower, which, together with the 20-30-horsepower on view, has been the line made up to the schedule for 1907. For next year the demand for higher power cars will be met with a 70-90-horsepower. The cars are all identical in detail and construction, so the description of the 20-30 will fit all. The motor has four cylinders cast in pairs with integral heads and jackets. The valves are on opposite sides, the inlets being on the right and the exhausts on the left. The carbureter is of the usual automatic jet-feed type, and is controlled by a foot pedal. The gasoline tank is carried at the rear of the car with pressure feed. The exhaust pipe is cast with four ribs and has an easy slope to the muffler. The crankcase is in two parts and encloses the camshafts, as well as all gears. The clutch is made up of fifty-two large disks running in an oil bath with but a single adjustment, which is the tightening of a thrust spring for increasing the friction. The transmission case, as well as the engine, is carried directly on the side frame members. In the differential the drive is by side chains, and the change gears are carried in the same casing with two large, removable top covers. All gears are run on annular ball bearings. The four speeds forward and reverse are made selective through a gate quadrant. The side chains can be enclosed in cases to run in oil. This fitting is not put on except when ordered, although all the chassis are so made that the casing can be put on at any time. Ignition is by low-tension Simms-Bosch magneto driven by gears directly from the main shaft and placed on the inlet side of the motor, although independent of the inlet camshaft. The water pump is driven in the same manner and placed to the left, or exhaust, side of the main shaft. Carried above the motor are four small insulated plugs which provide a means for testing the different cylinders. The spark is advanced or retarded by a lever over the steering wheel. The water cooler is hung independently of the frame to keep it free of all shocks and road vibrations. The dashboard is of that shape which follows the line of the hood and the toe board is of the sharply-inclined design, both of which seem to be rather peculiar to Italian machines. This sharply inclined toe board permits a fairly straight run of the exhaust pipe, freeing it from sharp bends.

**Mercedes Import Co.—Mercedes**

The 1906 Mercedes details find themselves in the 1907 models with but slight changes. The most radical departure is in the carbureter. The shape has been altered entirely, the air and gas passage being the shape of a quarter turn elbow. The jet has a needle valve for adjusting the gasoline flow and the passage is hot-water jacketed. At the center of the elbow is a swinging shutter having a cross section shape simple to one-half the conventional heart with the curved edge on the approaching side. In this edge is cut a semi-circular groove that has been aptly described as looking very much like a shoe horn, with the concave face to the front, or approaching side of the shutter. The jet projects into the small groove thus formed, the shutter acting as a bridge or top half of a restricted passage. This passage is about ¾ inch in diameter to give a good velocity of air when the main throttle is closed. When the throttle is opened the shutter swings inward and up and away from the jet. On the shutter spindle is a cam, outside the casting and in an extension of the shutter spindle, with two flat faces at approximate right angles to one another. A flat spring blade, with adjustable tension, rests against one face when the shutter is closed and against the other face when the shutter is open. This spring merely acts to prevent sudden jumps of the shutter, but is not stiff enough to prevent closing from the shutter's own weight. A feed pipe leads from near the top of the carbureter, at right

GERMAN MERCEDES LIMOUSINE

angles, and is opened or closed by a plain throttle with its lever on top the elbow of the carbureter. Another notable change in detail is the placing of the chains in an oil bath by enclosing them in a casing running their entire length and around the sprockets, a legacy from the English bicycle. Other changes are a pump of larger dimensions and gear-driven. An inverted V pipe is connected to two bearings, one on either side of the pump, with a grease cup in the center of the bend. The lubricating system has had some changes. A sight feed lubricator with eight drips is fitted to the dash with the pressure maintained by an internal pump actuated from a vertical rod and eccentric on the end of the inlet valve camshaft, the rotary action being given to the lubricator spindle, which passes through to the point of the dash by means of a clutch. Four models are shown by the Mercedes Import Co.

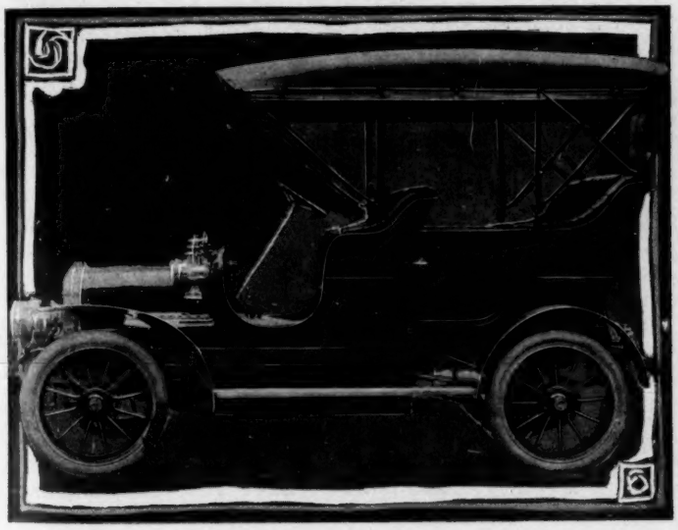
**Detroit Auto Vehicle Co.—Detroit**

A five-passenger touring car, a two-passenger runabout with rumble seat on the back deck and a stripped chassis comprise this exhibit. The touring car and runabout are fitted with identical chassis. Combined in this chassis is the use of a 22-24-horsepower two-cylinder opposed water-cooled motor carried crosswise in front beneath the bonnet, a cone clutch system, Brown-Lipe transmission and final shaft drive. The crankshaft, transmission shaft and propeller shaft incline forward, so that under load they are practically all in line. Arrangements are made, however, to care for any discrepancies in alignment by the introduction of a couple of universal joints, one at the front and the other at the rear of the propeller shaft. The cylinder bore and stroke are 5⅛ and 4½ inches respectively, and the connecting rods are offset so as to have one cylinder working as nearly in line with the other as possible. A flexible connection

with the transmission is through a unique form of cone clutch, in which the female portion is a cup-shaped piece receiving the leather-faced male portion, a very stiff shaft spring serving for engagement and pedal release. In the running gear are combined such points of construction as a semi-elliptic spring in front and rear, a 96-inch wheelbase, a car frame with side pieces straight from end to end, a tubular front axle carrying LeMoine steering knuckles and internal and external brakes acting upon drums on the rear hubs. Steering is through an irreversible gear, the radiator is of a special type, and ignition is by jump spark.

**Charron, Girardot & Voigt—C. G. V.**

The C. G. V. is shown in the 20-25, the 30-35 and the 50-horsepower models, with limousine, landaulet and touring bodies. In addition a new C. G. V. is shown in a 14-18-horsepower town car. The motor has its four cylinders cast in one, with the valves all on the left side. The steering wheel is placed at the left side of the car with the gear-shifting lever and the emergency brake lever in the middle of the footboard and just forward of the driver's seat. This grouping is made with the idea of facilitating driving in the city. The car is shaft-driven and has three speeds forward and a reverse. The chassis is fitted at the rear with large, full-sweeping C springs, giving a particularly easy-riding and well-hung body. In all essentials the cars are the same as those of 1906, the only changes being that the cams have been changed somewhat in profile to give a quicker lift, a longer opening and a quicker drop, and that the side chains will be run in oil baths in enclosed cases. The motor and gear-box continue to be hung on a three-point suspension. Ignition is by high-tension magneto and supplemental coil and storage battery. Other than in the town car the cylinders continue to



FRICTION-DRIVE CARTERCAR, TOURING MODEL

be cast separately with attached water plates at the front and back sides of each cylinder. The sliding gear has four forward and one reverse speed, with an expanding brake separate from but attached to the rear corner of the transmission case, which is extended to take in the differential. The clutch is of the leather-faced cone type. The pump is gear-driven and the water cooler continues to be placed under the fore part of the frame, the bonnet keeping to the well-known lines of its long and gradual downward sweep toward the front.

**Johnson Service Co.—Johnson Steamers**

A touring car and limousine are exhibited in this stand, both built along the same body lines as gasoline cars with such accurate imitation that the casual observer would fail to note the difference unless directed to it. The bonnet, beneath which is housed the motor, is exceptionally long. The engine in this car is fashioned largely after gasoline lines with its vertical cylinders and valves in the bottom of ports on the one side. The cylinder bore is 3¼ inches, the stroke 4 inches and the crank-shaft has five bearings, one at each end and one between each two of the adjacent four cylinders. The valve scheme is very much gasoline, the poppet valves being lifted by vertical lift rods worked through cams on an enclosed camshaft. The steam generating plant is a nest of tubes formed of cold drawn steel tubes of small bore and joined in one continuous tube measuring 450 feet in length if pulled into one straight tube. The convolutions in this tube are such that it is packed away into a compact box-like space. The steam is superheated to 650 degrees. A thermostat cares for the regulation of the temperature of the superheated steam, preventing it reaching too high or too low a temperature and giving an automatic control of this. The water supply is copious and the fire system is much as when the cars were last shown. The cars shown have 112-inch wheelbase, pressed steel frame, Swedish steel springs, and drive from the motor is by shaft.

**Argus Import Motor Co.—Argus**

The exhibit is made up of a touring car and a chassis, both with 40-horsepower motors. There is also a motor of the same size, mounted as a unit for speed launches. The cylinders are cast in pairs with dome-shaped tops and oppositely positioned valve housings. Each pair is placed somewhat further apart than is common in general practice, giving the motor a rather lengthy appearance. The drive is through a clutch with a spiral spring, practically of the Mercedes type, to a four-speed and reverse gear box, with cross shaft and side chains. All bearings run on annular ball races. The gears are of the selective type with a gate quadrant. Three brakes are equipped, one on the cross shaft at the right side of the gear box and two in the rear hubs. The gear box hangs direct on the side frame members at the front, and from two points at the back on the cross frame member. The reverse gear is a falling gear carried at the top of the gear box. Ignition is by high tension magneto and also by commutator with spark coil on the dash. The commutator is driven from the forward end of the exhaust camshaft, while the magneto is driven by a cross-over gear from the intake camshaft. The centrifugal water pump is driven from a cross-over gear at the back end of the exhaust camshaft. The carbureter is waterjacketed and the barrel throttle type. Cooling is both by a fan back of the radiator and by a bladed fly-wheel. Feed to the carbureter is from a pressure tank carried at the rear of the frame. Lubrication is through two sight feeds and an auxiliary hand pump, on the dash, from a supply tank carried just below the right frame member at a point back of the dash. The feed is by air pressure, the pump for which is attached to the rear right corner of the crank case, having its plunger worked by a right angle arm extending around and connecting with the lower end of the rear inlet valve stem.

**Harrison Wagon Co.—Harrison**

This company exhibits for the first time at a New York show two 40-horsepower touring cars, with 5-inch by 5-inch separately-cast cylinders of regular Harrison construction, distinguished by automatic inlet valves in the cylinder heads on the left side and exhaust valves, also located in the cylinder head, on the right side and operated from a camshaft by lift rod and rocker

NEW WATER-COOLED AEROCAR

CLEVELAND IN LIMOUSINE DRESS

arm action. Transmission is through a cone clutch and three-speed and reverse gearset, in which the gears are always meshed, and final shaft drive, the latter feature being one of the changes in the 1907 models, a chain drive having been previously used. The makers place special importance on their self-starting motor, in which a compressed air system, coupled with the acetylene gas tank is used. In starting the cylinders are first filled with acetylene gas with a pressure of 7 pounds to the square inch, after which compressed air, first with a 20-pound pressure and finally with a 10-pound pressure, is introduced, after which the spark is thrown in, exploding the mixture and starting the motor, immediately upon which the gasoline mixture is drawn from the carbureter by the motor suction. Associated with the carburetion system is the heating of the incoming air by having the return water pipe from the waterjackets passing through this air pipe, and further connected with it is an external valve for the admission of cold air into the cylinders, this being used when descending hills, when the motor is used as a brake. Noteworthy on the car is the simplifying of the ignition system, in which current is taken from storage cells, high-tensioned through a standard coil and then delivered to the plugs by a gear-driven commutator. On the car dash is a device for determining if each of the spark plugs is in working order. In connection with the starting of the motor is also used a compression relief system, consisting of a horizontal shaft lying along the cylinder heads and extending through the dash, where it carries a crank. On this shaft are arms, one for each of the inlet valves, the ends of these arms resting on the ends of the valve stems and by part rotation of the crank the inlet valves are opened. Both cars exhibited have a 123-inch wheelbase, 36-inch by 4-inch tires and floating type of rear axle.

**Cryder & Co.—Mors**

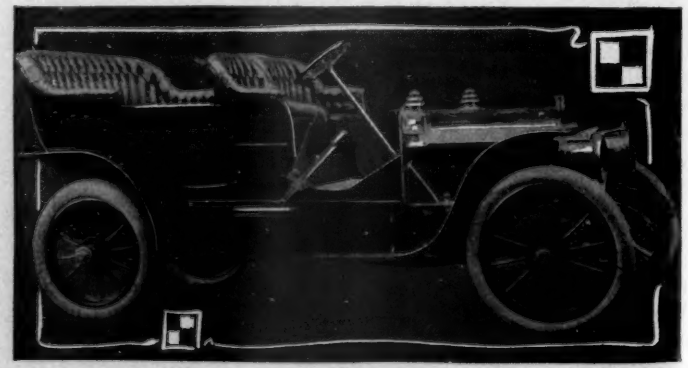
A 45-horsepower French Mors chassis and two town car limousines are in this exhibit. The new chassis has a four-cylinder motor, 4⅛ by 5½ inches, rated at 45-60 horsepower by the maker. This is fitted with sliding gear transmission, pump for cooling, make-and-break ignition, with magneto, and has chains for final drive. It is also fitted with the French Mors starting device, which consists of a hand pump at the right of the operator that makes gas and forces it into the cylinders after stop cocks have been opened to permit the mixture to enter. After this operation the ignition switch is turned on and the motor starts the same as if gas had remained in the motor. The chassis has a double ignition set, compound brakes and other minor features. The town cars are entirely new to this country, well supplied with power and at the same time are sufficiently short to enable them to be easily handled in and about crowded streets. To meet these requirements the motor is placed under the driver's seat and is fairly well arranged from the standpoint of accessibility. It is not often adjustments have to be made about a town car, so that accessibility is not so much required as on a touring car. The cars are comparatively lightly powered, substantial in appearance and handsomely completed from the standpoint of the body maker. The cars have much the appearance of electric broughams. The Mors compound brake acts on the ordinary brake in a manner similar to a capstan by means of a pulley located on the differential, the momentum of the vehicle being used to intensify the strength of the ordinary brake.

**B. L. M. Motor and Equipment Co.—B. L. M. Pirate.**

The B. L. M. Pirate runabout and the landaulet use the same chassis fitted with 24-horsepower motor with four cylinders cast in pairs, and having intake and exhaust valves on opposite sides calling for the use of two enclosed camshafts. Half-time gears on the forward end are partly enclosed. An equal distribution of parts is accomplished by carrying the Xenia carbureter on the right and having the high-tension magneto and water pump driven by gears on the other side. Lubrication of the motor is by splash feed to the crankcase through sight feeds under pressure maintained by a gear pump. The oil feed is according to the motor speed. An oil tank located in the dash and kept warm by the heat of the engine sends the full pump capacity of oil to the crankcase when a valve on the dash is opened for that purpose. The Eisemann magneto supplies the current which is delivered by it to the spark plugs carried in the caps over the intake valves. The spark lever has two positions, one retarded for starting and the other slightly advanced for running. As the motor speed increases so does the intensity of the spark, this giving a quicker promulgation of the flame through the mixture. The spider in the cone clutch is novel in that it is faced with cast iron instead of leather, and it engages with the inside of a cast-steel ring carried on the flywheel. This ring is split on its diameter, and it may be taken out without disturbing the gearcase. The transmission gives three changes of speed for forward traveling with a single reverse. All gears and shafts are of chrome nickel steel, and annular ball bearings carry all shafts. The service brake, operated by the right pedal, is a pair of bronze shoes lined with cast iron, and the rear hub brakes have expanding bronze shoes. Steering is through a worm and segment gear with all working parts of chrome nickel steel. Details of the Pirate runabout are: 98-inch wheelbase, 32-inch wheels with 3½-inch tires. The weight is 1,350 pounds.

**American Locomotive Automobile Co.—Berliet**

This American reproduction of a French car is shown in a 22-horsepower limousine, a 40-horsepower touring car and a 60-horsepower touring car. These cars are identical in construction as regards details, and variations from last year's cars are not distinguishable. The cylinder dimensions are 4-inch bore and 4⅝-inch stroke for the 22-horsepower; with 4⅝-inch bore and 5⅜-inch stroke for the 40-horsepower, and 5⅜ inches as the measurement for both bore and stroke on the 60-horsepower. The valves are placed on opposite sides, the inlets being on the right and exhausts on the left. The motor is carried direct on the side frame members. The drive is through a multiple disk clutch to a four-speed and reverse gearbox with selective sliding gears, and cross shaft to side chains for the final drive. The lubrication is by a mechanical force-feed oiler, belt-driven, together with splash lubrication in the crankcase. Ignition is by Simms-Bosch low-tension magneto. The oil pump is centrifugal and placed directly back of the honeycomb radiator. A ball governor is carried on the exhaust camshaft gear and acts on the

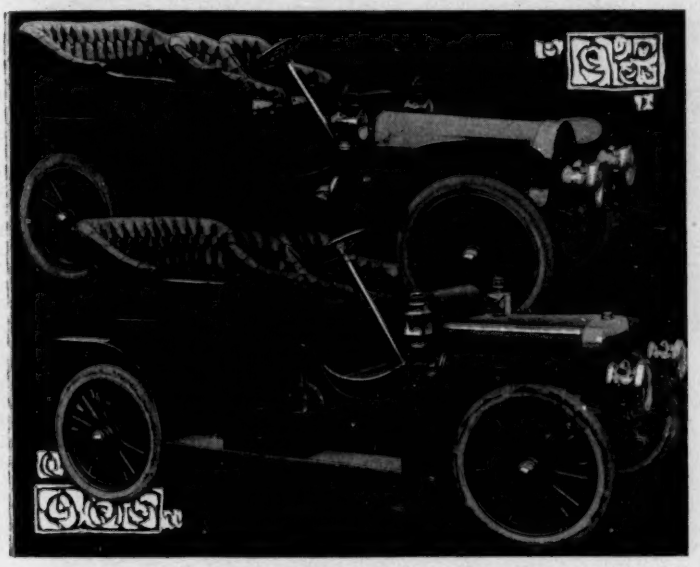


MOON IN THE TOURING CAR MODEL

carbureter, its control being maintained through a foot pedal at the right of the steering column, on the toe board. The wheelbase on all the models is 126 inches and the tread 55 inches. On the smaller car the front tires are 36⅓ by 3⅜ inches and on the two larger models the same tires are 36⅜ by 4⅛ inches. The rear wheels are alike in all three cars, the tire sizes being 36⅓ by 4⅛ inches. The seating capacity of the smaller car is five persons, while that of the larger cars is seven.

**Berkshire Automobile Co.—Berkshire**

Using Hess-Bright bearings in the transmission and four road wheels, installing a double ignition scheme, one a Pittsfield magneto and the other a storage battery outfit, using I-beam nickel steel axles in front and rear, having 36 by 3½ and 4½-inch tires in front and rear, respectively, and fitting an entirely new design of body of the five-passenger type, are some of the leading changes made in these cars since seen at a New York motor show last January. But two machines are exhibited, one a five-passenger touring car and the other a stripped chassis. In these the Berkshire double chain drive scheme is retained, as is its



TWO OF THE TRIBE OF JACKSON

special type of transmission, in which the main and countershaft gears are constantly in mesh and in which changes of speed are made by a sliding shaft scheme in which the required gears are locked to their shafts. Braking is by a pedal running brake scheme on the jackshaft and emergency brakes in the back hubs. In the framework the use of a subframe to carry the motor and gearset is continued, and a dust pan extending the entire length of the frame is added. The wheelbase is 118 inches, and the tread standard. The 35-horsepower motor has four separately cast cylinders with 4⅛-inch bore and 5½-inch stroke, and the crankshaft is carried on five bearings. Two ignition systems fitted have separate sets of spark plugs, and the lubricating is under pressure from a gear pump, which forces the oil to each bearing of the motor, thence through the hollow crankshaft and up through the connecting rods to the wrist pin, after which it lubricates the cylinder walls and finally augments the splash in the crankcase. The clutch is of the multiple disk type running in oil, and the carbureter is of the automatic style. Wheels are 36 inches in diameter and carry 3½ and 4½-inch tires. Other features are cellular radiator, steering wheel control and worm and sector steering gear.

**Palais de L'Automobile—Delaunay-Belleville**

The chief interest in this display centers on the Delaunay-Bellville cars shown in the three sizes made—20, 28 and a 40 horsepower. Three-quarter phaeton, landaulet and touring bodies are fitted respectively. The only changes from last year's cars are that the 20-horsepower replaces the 16-horsepower and the bores and strokes of the two larger cars have been increased, although the rating remains the same. The present sizes are 44 by 5½ inches and 5 by 5¼ inches, bore and stroke respectively. The smaller size can be had in shaft or double chain drive, while the two larger cars have side chains only. Other than the matter of size of the engine there have been no changes, while the transmission remains identical with that of last year. It will be remembered that one of the important details is the oil pump placed inside the crankcase. Lubrication is effected through a circulation of oil under pressure by means of a reciprocating oil pump with its valves arranged on the same lines as those of an oscillating engine driven by an eccentric off the crank shaft. From this the oil is forced continuously through the hollow crankshaft, up the hollow connecting rods and out to the cylinder walls through hollow piston pins, thus lubricating all parts from one source. The bottom of the crankcase slopes toward the flywheel that all the oil may collect in that end, that being the location of the pump. All three models have fans placed in the cylindrical case, which is a feature of the Delaunay-Bellville, and in the two larger models the flywheel is also made with fan blades to assure perfect cooling. This engine cooling is further assisted by cutting rearwardly-extending gills in the mud pan, carrying the engine heat down under the pan rather than along between the pan and the floor boards. The pan extends from beneath the radiator to the back of the gearcase. The cylinders are separately cast with inlet and exhaust valves on opposite sides. The ignition is normally by low tension magneto. The water pump is gear-driven and of the centrifugal type. The carbureter is of the spray design with variable automatic air admission. The springs are semi-elliptical in front, and at the rear of the three-point or platform assembly. The clutch is a leather-faced cone declutching to the rear. The gear case has four speeds and a reverse, annular ball bearings being used. The case is supported at three points. The dash is the gasoline tank, which is enlarged in capacity by making it also follow the lines of the inclined toe board on which are mounted two pressure gauges and the spark switch.

**Jackson Automobile Co.—Jackson**

Three styles of cars are manufactured by this company—one with the opposed two-cylinder motor placed amidship, the second with a similar style of motor mounted crosswise in front under the bonnet, and the third with a vertical four-cylinder motor carried in front. In the first two styles a planetary transmission system is used and a sliding set is employed in the four-cylinder class. Nothing definite in the drive to the back axle characterizes the company's design, as a single chain is used in one model and shafts in the other two. The two models with opposed cylinders are much alike except in the location of the motor and the consequent location of the transmission. The motors in these cars are about the same as before, with 5¼ by 5-inch cylinders and a horsepower rating of 20-24. The characteristic long rocker arm action for opening the valves is continued, it dispensing with the necessity for pushrods. In the car with the motor crosswise in front a thermo-syphon system of cooling is employed, there being a separate circulation for each, a cylinder jacket with large diameter of steam hose forming the conducting passages. This car is altered over that of the present season in that the motor is mounted with its crankshaft carried horizontally instead of inclined. The flywheel has been placed to the rear of the crankcase, and the transmission is moved further back. Square dash oil lamps are added and an imported LaCoste coil and timer are used. The car with the opposed motor amidships has been improved to the extent of a 96-inch wheelbase—6 inches longer than formerly—carrying a detachable tonneau, using a pressed steel frame, increasing the valve diameter and carrying a wider body. The four-cylinder car, model G, 40-45-horsepower with 5 by 5-inch cylinders, has separately-cast cylinders, with mechanical intake and exhaust valves in the head and both sets opened by rocket arms worked from the right side of the motor from one camshaft. The intake and exhaust valve cage in each cylinder is retained by a double arm yoke. The motor layout comprises the gear water pump on the

right in front and the timer on the top of a short vertical shaft in the rear. A Schebler carbureter furnishes the mixture. The flexible connection between the motor and sliding gearset is a nine-disk clutch with four bronze disks secured to the flywheel and alternating with these five steel disks supported on the transmission shaft. The driveshaft is housed from the differential to a point in rear of the gearbox, where its forward end is trunnioned on a frame cross piece, at which point a universal joint is used in the driveshaft. No radius or torsion rod is used,

WHITE EXHIBIT A LARGE ONE

the semi-elliptic rear springs being bolted directly to the frame pieces at the front end. Featured in this transmission plant is the use of a floating back axle, ball bearings in the gearbox for both shafts and ball bearings carrying the road wheels.

**Motorcar Co.—Cartercar**

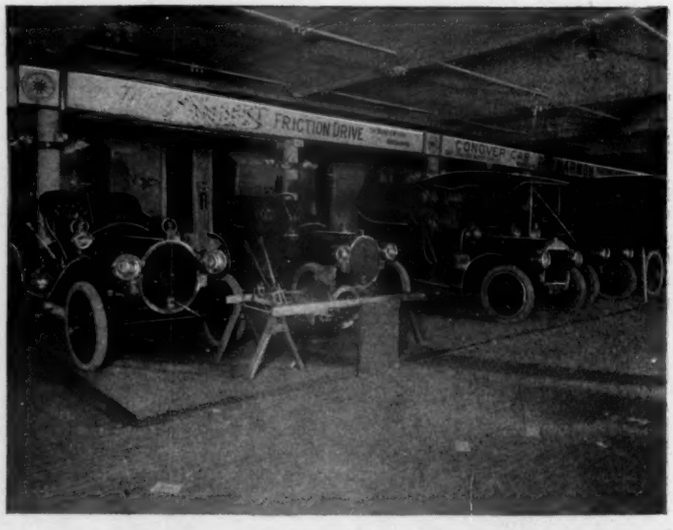
A chassis, a touring car and a convertible surrey with folding rear seat, transforming the vehicle into a runabout, are shown. The car has been improved over the past by increasing the bore of the motor cylinders ¼-inch, it now being 5¼ inches, while the stroke remains at 4½ inches. The changes in the body are the lengthening of the bonnet 2 inches; the making of the front footboard much deeper from the front to rear and a one-piece aluminum dash. The friction drive of transmission on these machines remains unaltered, but a Diamond "301" chain is used for driving to the back axle instead of a roller chain. The wheelbase has been added to a couple of inches, bringing it up to 96 inches. These machines, known as Cartercars, are also built with commercial bodies for light delivery work. The friction transmission consists of a large 20-inch aluminum-alloy disk on the back end of a shaft axially in line with the crankshaft, and a 20-inch friction wheel carried on a cross shaft and contacting with the friction disk. In engagement the disk is carried back against the wheel, which is effected by attaching the front end of the disk shaft to the flywheel through a three arm spider, each arm anchoring with a stud on the flywheel face. The periphery of the friction-wheel rim is paper, 1⅝ inches wide.

**Maxwell-Briscoe Motor Co.—Maxwell**

The Maxwell line of five cars is shown in the three types of chassis. The 12-horsepower chassis is fitted with runabout and speedster bodies, these differing from the other models in the employment of a planetary gearset. There are also shown the two-cylinder horizontal 20-horsepower chassis and the 36-40-horsepower, four-cylinder vertical car, both models having 5-inch by 5-inch cylinders and sliding gear transmissions with three forward speeds and a reverse. The Maxwell method of carrying the cylinders and the gearsets in one unit and supported at three points holds good in all models of whatever size. The water-cooling system is also alike in all models, being of the thermo-syphon system with the return pipe branched to either side of the radiator about midway of its height. The valves in all motors are mechanically operated and all the cylinders are water-jacketed throughout the length of the piston stroke. The 1907 model of the four-cylinder car is identical with that which won the Deming trophy this year, the only change being in the body, which is now larger and more luxuriantly appointed. The clutch used in all models is of the multiple disk type entirely encased in an oil bath. In the large car the valves are placed on opposite sides and the operating camshafts are enclosed within the crankcase. The valves are forged in one piece. By the use of the individual cylinder construction, five main bearings take up the working load. The connecting rods are adjustable at both ends, the upper end bearing on a hardened and ground wristpin. Splash oiling is not entirely depended upon as oil is positively fed to each cylinder by the system employed.

**Rolls-Royce, Ltd., New York—Rolls-Royce**

This recent addition to the list of imported cars coming from England has six cylinders cast in pairs with exhaust valves on the left side. The waterjackets have plates on the forward and the back sides of each set to give a shortened length to the over-all measure. The bore is 4 inches with a stroke of 5½ inches. Inlet valves are over the heads at the center operated from the common cam by pushrods. The carbureter is on the right side with three-way manifold running to the three pairs of cylinders. Water circulation is by a gear pump carried on the forward right corner of the crankcase and driven by a shaft with a small spur driven off the main shaft. The cooler is made up of a number of small tubes passing vertically through plate flanges, each flange extending the full width and length of the cooler and placed about a quarter-inch apart up and down. Ignition is by storage battery, coil and commutator. The drive of the commutator shaft for this ignition system is very much out of the ordinary. From the forward left corner of the crankcase there is an upright shaft driven by a skew gear off the camshaft. Just above the casing containing this gear is a bell-shaped aluminum casing which contains the governor. The shaft continues above this to yet another aluminum casing containing a skew gear, meshing with its mate on the forward end of a long shaft running through to the back side of the dash. This




NICE DISPLAY MADE BY THE BUCKEYE COMPANY

shaft is just above and a little to the left of the valve house, finishing at the commutator. At the forward end of this shaft, at the point of the skew gear connecting, is the device for changing the time of the commutator. This is controlled by a wire running over a pulley, then down and around another pulley at the corner and the forward cylinder waterjacket, then back to the base of the steering column, then through the steering column to an index plate about the steering wheel. Lubrication is by force feed to a six-way sight located above the oil tank

carried at the rear of the dash. The oil tank has a sight gauge on its face. The drop sights mentioned have on the brass holder supporting them an index plate giving the number of drops passing per minute to the different feeds. The drive for this oil feed is off a pulley, attached to the commutator shaft heretofore described, which is forward of where the shaft passes through the dash. The clutch is a leather-faced cone moving forward into the flywheel. The gearbox, which is supported on the same subframe that carries the engine, has a four-forward

WHERE THE GLIDE OF PEORIA IS LOCATED

and reverse speed operated through a quadrant. The entire shaft at the base of the change lever moves back or forth to the various selected positions, leverage being gained by pivoting it at the bottom and extending a couple of arms up from the shaft to a pivot connection just under the quadrant. Directly back of the gearcase is the footbrake, of large diameter. The final drive is through an exposed propeller shaft to a live rear axle. The strut supporting the rear differential is in the form of an up and down triangle with its apex working in a spring tube dropped from the center cross frame member. The frame is of pressed steel with five cross frame members, the rear member resting on a platform spring with shackle connection at the rear ends of the rear springs, giving a three-point suspension at the rear. Front springs are half-elliptical, under the narrowed inside frame members. Steering is by worm and nut with the cross tie forward of the I-beam front axle.

**Austin Automobile Co.—Austin**

The two Austin touring cars exhibited are identical in practically every deal except, perhaps, for slight differences in finish. Both are 60-horsepower machines, with motors consisting of four separate cylinder castings, each with a bore and stroke of 5½ inches. The exhaust valves are in the bottom of ports on the right and the intakes in the tops of the same ports, one camshaft opening both seats, the exhausts by direct lifter rods and the intakes by lifter rods and rocker arms. High tension is used with current furnished by a Bosch gear-driven magneto. Cooling is by feeder radiator with circulation assisted by gear-driven pump. The clutch is a disk product with alternating sets of steel disks running in oil and engaged by coilspring and disengaged by pedal. The transmission gives four forward speeds and one for reversing, the changes being made along selective lines, which fact brings the reader to the most interesting part of the car—the change speed lever, which gives the four forward speeds. The gearset has two shifter rods which, at their forward ends, are attached respectively to cranks carried on a cross shaft and a sleeve surrounding this shaft. On the outer end of the rod and sleeve, outside of the car frame, are short vertical levers with which the change speed lever can be locked without recourse to a gate quadrant. With the change speed lever vertical the gears are neutral. Pressing down on the lever locks it with one of the short arms, then pushing ahead gives first speed and drawing it to the back end of the slot is second speed. If, when the lever is in neutral, it is slightly raised and then pushed forward, the third speed is engaged. Pulling it to the rear gives fourth speed. The change speed lever locks with these arms by means of a pin entering a recess in the arm. For reverse a separate lever in the car footboard is used. An interlocking system prevents shifting of the gears with the clutch engaged and also prevents the accidental engagement or the reverse. Drive is by shaft, and while the back end of the frame is supported on two three-quarter elliptic springs a torsion rod is not used, nor is the driveshaft encased. Motor support is on angle cross pieces bolted to the ends of the crankcase, these cross pieces resting in saddles carried on the frame side members. The transmission case is carried beneath a pair of cross members of the frame. The rear axle is of the floating type with the driveshaft carried on Timken bearings, while the transmission has annular ball bearings and the road wheels roller bearings. The wheelbase on the model is 115 inches.

**Napier Co. of America—Napier**

The American manufacturer of this English type car offers for the approaching season two models, one an 18-20-horsepower runabout and the other a 60-horsepower six-cylinder car, the motor having its cylinders in pairs. The bore and stroke are 5 and 4 inches, respectively, this being a forceful example of that tendency to make the cylinder bore considerably in excess of the stroke. Each cylinder casting is a unit and has its mechanical valves in the bottom of ports on the left. In actuating these one steel camshaft is required, it having six intake cams and the six exhaust cams forged integrally with it, and to reduce noise the shape of these cams has been slightly altered. A great deal of care and work has been bestowed upon the manufacture of the camshaft for this motor, it being a ground chrome nickel steel forging bored internally for the lubricating system. The flow of oil is created by an oil pump carried in the bottom half of the crankcase and gear-driven from the camshaft. This pump sends a bank of leads to sightfeeds on the dash, from which other leads connect to the four main bearings of the motor. A special lead conducts oil to the cylinders, it being subdivided into six branches, one to each cylinder. From the main

RAMBLER EXHIBIT, ONE OF THE LARGEST

crankshaft bearings the oil passes through the bore in the shaft to the lower bearings of the connecting rods, and by boring the connecting rods up to the wrist pins the oil is forced upwards to lubricate the wrist pins, and finally exits from these bearings to the cylinder walls. In the bottom of the crankcase a splash system is also maintained, and to insure abundant splash troughs in the bottom of the crankcase beneath these connecting rods are concaved, forming special oil wells, which are always certain to be well filled with lubricant and into which the lower

TWO MODELS OF THE CRAWFORD

ends of the connecting rods dip once in each revolution. The change in the synchronized ignition scheme is that the distributing device is carried on the front of the dash beneath the bonnet instead of on the rear facing the driver, and is now gear-driven instead of chained. The Napier carbureter includes in its make-up a water regulator. The compensating valve is coupled up to the smaller of two finger levers on the steering wheel and an accelerator is interconnected with governor mechanism. Choice is given of two types of clutches, one of the metal-to-metal cone type and the other a disk system. The Napier selective sliding gear system remains much as the present, having all of its shafts carried on Hess-Bright bearings and gears made from specially treated chrome-nickel steel. The case is still located midway between the clutch and rear axle, calling for the use of a medium length shaft between the clutch and it, and another for connecting it with the rear axle. This axle, of the semi-floating type, has its drive shafts supported on ball bearings within the axle housings, which bearings also support the road-wheels. Braking is through a regular clamping brake operating on a drum on the driveshaft in rear of the transmission, and internal expanding brakes working within drums on the rear wheels. Other features of this large car are 126-inch wheel base, seven-passenger body with room for five in the tonneau, and in the control the brake system is interlocking with the clutch. The front axle is of I-beam suction, and the wheels are 26 inches in diameter. The Napier Nike is the company's four-cylinder runabout. The engine is 3½ inches bore with a 4-inch stroke, and in all its details is a counterpart of the six-cylinder. In fact, throughout the car is a duplicate in construction and details of its bigger brother. The ratio of gear at the axle is relatively low, 1 to 4, so that the car can take any ordinary hill on top speed, as well as giving flexibility in handling in cities. The rated horsepower is 18 at 1,500 revolutions.

**Torbensen Motor Car Co.—Torbensen**

The chassis of the Torbensen truck, the only exhibit of this company, is featured by a peculiar type of air-cooled opposed motor located transversely in front and with the Torbensen spur gear drive. The car has two frames—one a subframe supporting the motor and the transmission. This frame is carried at its rear on the stationary back axle with which it has a rocking support, and at its front on a transverse semi-elliptic spring which is, in turn, carried on the main frame of the truck. The motor and power plant being on the subframe, a universal joint between the motor and planetary transmission on the jackshaft is not needed. The jackshaft is close in front of the back axle and carries on each end a spur pinion which meshes with a large internal gear carried on the back wheel, giving a spur gear drive. The wheel gear and the jackshaft pinions are enclosed. The motor, rated at 20 horsepower, has its 5⅛ by 4½-inch cylinders cooled by integral circular flanges and its head and valve ports by other flanges. The feature of the valve arrangement is that the incoming gas is forced to pass the exhaust valve before it reaches the intake valve, this being used as a means of keeping the exhaust valves cooled. The valves, all mechanically-operated, are on the tops of the cylinders and carried in integral ports above the outer end of the cylinder bore. One camshaft opens them. The car, or rather truck, has three brakes, a band on the jackshaft and a couple of bands acting on the outer face of the large internal rear wheel gears. With the exception of the motor Timken roller bearings are in use. The frame is of angle steel, the wheelbase 89 inches long, wheels 32 by 3½, carrying solid rubber tires, and the spring system is a platform in front and rear with an additional transverse spring on which the front end of the subframe is carried. The rear axle is of square cross section 1¾ inches to the side.

**Moon Motor Car Co.—Moon**

One of the new faces much talked about before the opening of the show and waited for anxiously until Sunday morning, when it was finally located in its exhibit space is the new Moon car, an entirely different product from that marketed by this concern during the present season. The car, a five-passenger touring vehicle with 110-inch wheelbase and 34 by 3½ and 4½-inch wheels, carries a most compact 30-35-horsepower motor with its cylinders cast in pairs and valves carried side by side in the cylinder heads, intakes at the right side. In operating these valves recourse is had to a single camshaft carried over the tops of the cylinders and not enclosed. This shaft is driven at its forward end through a bevel gear on the top of a vertical shaft rising in front of the forward cylinders and driven off the crankshaft by bevels. The lower bevels of the shaft are encased in a separate housing in front of the crankcase and the top bevels are encased in a special housing. In opening the valves only one rocker arm is needed for each cylinder, one end of it pressing on top of the exhaust valve stem to open it and the other end doing similar service with the intake valve. This rocker arm is carried below the camshaft and is centrally supported on a bearing on the crankshaft support. Surrounding the hub of this rocker arm is a spring which serves to open the intake valve, while the exhaust valve is opened by the lift occasioned by the major diameter part of the cam. The cam does not bear directly on the rocker arm but against a roller supported on an arm on the left half of the rocker arm. The cam used is a compound, one of three distinct curves—a major part for lifting the right end of the rocker arm at the time the exhaust valve stem opens the valve; a medium-diameter part which keeps the rocker arm in a medium position during the compression and explosion stroke; and a minimum diameter part—being a depression of less diameter than the medium—into which the right end of the push rod is forced by the tension

ST. LOUIS TOURIST AND RUNABOUT

of the spring on the rocker arm hub. At the same time the intake end of the rocker arm is lowered, opening the intake valve. This valve is thus opened by the pressure of the spring. The carrying of the camshaft over the cylinder heads is on three bearings, one on each cylinder pair and the other at the front end of the shaft, which support serves as a guide for the vertical shaft driving the camshaft. On the rear end of the shaft is carried the timer, located in the dash and encased in a removable brass cup. The mechanical oiler is belt-driven, also from the rear end of the camshaft, and the centrifugal water pump is spur gear-driven off the vertical shaft, in front. By this method the camshaft, the crankshaft and the vertical shaft connecting the two, are the only shafts of the motor. Ignition is by jump spark with current from storage cells. A multiple disk clutch carried in the barrel hub of the flywheel is used, the disks being twenty-eight of bronze and twenty-nine of steel. Both sets are of 9-inch diameter. The transmission is a four-speed and reverse set, operating on the selective principle, with the change speed lever working in a three-slot quadrant, the third and inner slot for one movement only of the lever and entered by using a press button. The lever can leave without the use of this button. Drive is by shaft with universal joint at both ends. Supporting the rear axle, at which point are used full elliptic springs, is a triangular brace rod system with its apex on a cross piece of the car frame at the rear of the transmission, where it is carried in a ball and socket support, and the base formed by the back axle housing to which the ends of the brace rods are attached. Both brake sets act through equalizers and are carried on the rear hubs, acting internally and externally. The use of either set disengages the clutch. A special form of tightening the external bands is used by which an equal pressure is brought upon each end of the band. Plain bearings are used in the motor and gearset, and balls in the wheels and back axle. The car frame is dropped, Renault fashion, 3½ inches in front of the back axle and the motor and gearset are carried on a subframe, a combination permitting of straight side pieces of the main frame and the use of full elliptic rear springs. The front axle is of I-beam section and carries Elliott type of end jaws for the steering pivots.

**Dolson Automobile Co.—Dolson**

Four cars, all late in arriving, are on view—three touring cars and the fourth the Cannon runabout. One touring car and the runabout have 60-horsepower motors with 5 by 5½-inch cylinders. The remaining two touring cars get their power from 35-horsepower motors with 4½ by 5¼-inch cylinders. The motor, clutch transmission and other features are the same in all four except the rear axle, which is of the floating type in the high-powered cars but of the non-floating type in the 35-horsepower machines. The motor has its cylinders cast in pairs with valves side by side, on the left, and opened by direct acting liftrods from one camshaft. Ignition is by jump spark with current from storage cells. The motor cooling and lubrication follow standard practice. The clutch used is a metal cone acting within a metal cup in the flywheel—metal to metal. Changes in speed are through a selective set giving three ratios forward. Drive is by shaft and brakes, running and emergency, are on the rear hubs, the latter of the internal type, disengaging the clutch when applied. The pressed steel frame has the side members narrowed alongside of the motor and the motor and gearbox carried on a subframe. Half elliptic springs are used in front and full elliptics in rear, the latter pivotally supporting the frame. The wheelbase is 123 inches. In the smaller cars the wheelbase is 110 inches.

# MOTOR CYCLE SECTION HAS HALF DOZEN EXHIBITORS

THE YEAR 1907 promises to be a banner one for motor cycles, a fact widely heralded by the many minor improvements shown in all parts of the construction of these little motor machines. The changes made in Curtiss machines are largely in detail, such as making the commutator so it is very difficult for it to work loose owing to the bushing being threaded into the fiber and having a large flange to strengthen the fiber. The valve slider, or opening rods, are now made of tool steel, a special Curtiss float feed carbureter is fitted, the motor stroke has been increased to 3¼ inches, the bore remaining at 3½ inches, giving a rating of 5 horsepower for the two-cylinder machine. The capacity of the fuel tanks is increased, a more efficient coil is added and but three cells of battery are now needed. The single-cylinder machine with a carrying platform in the rear of the driver's seat is shown. The two-cylinder machine has 58-inch wheelbase.

The American Motor Co. shows its Marsh-Metz machine with a 3-horsepower motor forming the lower part of the seat pillar and the motor bracketed between parts of the frame tubing. The frame throughout is of seamless tubing reinforced at the head. The forks are of the truss pattern with spring cushion sides. The carbureter has triple air inlet with automatic adjustment and drive is by a 1¾-inch double flat belt made of mineral tanned leather. The motor has 3¼-inch and 3¾-inch bore and stroke, respectively.

The American Metal Wheel & Body Co. is the first to exhibit baby motor machines propelled by electric power. The juvenile electric with its battery in the rear of the body has every essential of a big car, with its controller and brake system.

A number of changes have been made in the Yale-California motor cycle for 1907, samples of which, together with finished and unfinished parts are on exhibition. A new grip control consists of a lever the shape of the handlebar, with one wide bearing midway between the grip and handlebar stem. The end of the lever at the handlebar stem is turned down, and is fitted with a ball and socket joint, which allows the front wheel to be turned without causing the control to move. It is operated by an eccentric flange, attached to a loose grip. The engine has been straightened in the frame and is nearly vertical, while the spark plug will be on one side of the cylinder head, allowing easy access, and the carbureter is located under the tank, back of the engine. This gives a short gas line.

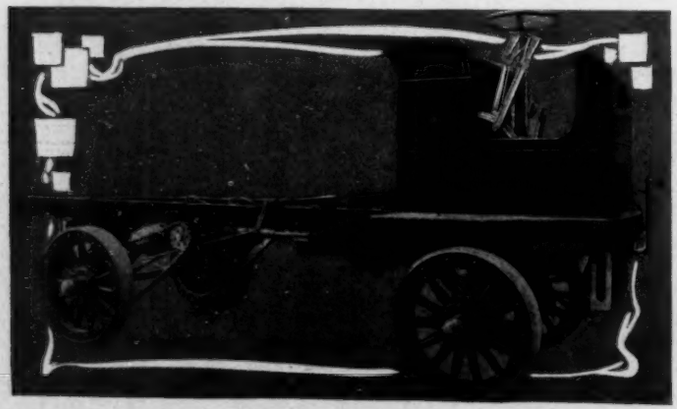
Three models—A, C and B—compose the exhibit of the Reading Standard Cycle Mfg. Co. On the new types the motor is hung low and is of 3 horsepower. The wheelbase is 51 inches and spring forks are used. There is independent adjustment of the driving and starting chains, ⅝-inch pitch roller chains made of Swedish steel being used. The gasoline tank and battery box are placed on the main frame, thus permitting a low saddle position and giving room for carrying tool bags or luggage carriers. A new oiling device allows of the motor being oiled while the machine is in motion.

The new 1907 Indian motor cycle, 2¼-horsepower, with 2⅝-inch and 3¼-inch bore and stroke, has a wheelbase 3 inches longer than formerly, now measuring 51 inches. A 50 per cent increase has been given to the gasoline tank, bringing its capacity up to 6 quarts. Instead of a chain and sprocket drive from the motor crankshaft to the compensating sprocket of the machine, a roller pin sprocket driving into a spur gear has been introduced, but no changes are shown in the final chain drive of the machine. The chain now used is ⅝-inch and of the roller type. A feature is the adding of a new oiler in the form of a force feed pump.

The two Wagner machines shown are identical in design and makeup, each having a single-cylinder 3-horsepower motor with 3-inch by 3-inch cylinders, 55-inch wheelbase, 2 inches longer than formerly, 125 pounds weight, 6 quarts gasoline capacity, 28-inch by 2½-inch Goodrich tires, single grip control and mixing valve for supplying the motor. This concern also handles two models of the imported Simplex motor cycles, both with 5 horsepower, two-cylinder motors with cylinders mounted in V fashion and ignition by Simms-Bosch high-tension magneto built into the motor cycle frame.

**Logan Construction Co.**

Logan for the coming season has swung heavily to the commercial line, turning out a couple of vehicles of this type—a light, air-cooled delivery wagon much after the fashion of that used this season, and a large 3-ton truck of entirely new design. The latter truck, model M, uses a 30-horsepower water-cooled motor of the horizontal opposed type with a pair of 5½ by 6-inch cylinders carried crosswise beneath the framework and well behind the front axle, the length of the motor being such that the cylinder heads project beyond the angle side frame pieces. The valves are carried in ports on the underside of the cylinder-heads, exhausts are operated by direct lifter rods worked from a camshaft carried in the bottom part of the crankcase, and the intakes, located in the outer ends of the ports, are automatically opened. The cylinders are separate castings bolting to the edges of the cubical crankcase made in four parts—a cover, a bottom containing the camshaft and its parts, and two side parts, one that part of the case above the crankshaft bearings and the other the lower half. Spark plugs are placed centrally in the cylinder heads, current from them coming from storage cells and high-tensioned and distributed in the usual manner. The motor is supported from the underside of the side frame pieces through lugs formed integrally with the cylinder casings, these lugs bolting to the horizontal lip of a bracket secured to the inner side of the angle frame sidepiece. The transmission system incorporates a contracting band clutch on the flywheel from which a short drive-shaft extends rearward to a point slightly back of the middle of the car, where it transfers its drive to a jackshaft from which double side chains transmit to the back wheels. The two-speed and reverse bevel change-speed gear is carried in the jackshaft housing with the differential and is of that type which gives direct drive on the two forward speeds and the reverse. On the jackshaft or differential shaft are two opposing bevel gears, one with a single ring of teeth and the other with a double ring, one at the periphery and the other half way to the hub. On the end of the propeller shaft are two pinions, one constantly in mesh with the other ring of teeth on both bevels and the other constantly in mesh with the inner bevel teeth on the one gear. A couple of clutches are used, one to clutch either of the small bevels on the propeller shaft to the shaft and the other to clutch the single or double bevel to the differential shaft. The truck has a wheelbase of 108 inches, 32 by 4½-inch rubber tires, and weighs 3,000 pounds. The other delivery, the light air-cooled type, remains much as at present, but has its countershaft gears enclosed, thus lessening the noise, and still using its sliding gear transmission and combination shaft and chain drive.



AMERICAN MOTOR TRUCK CO.'S CHASSIS

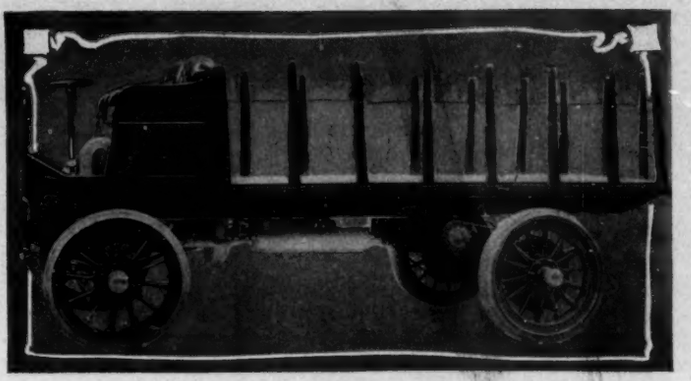
**Oscar Lear Automobile Co.**

Besides its line of pleasure cars the Frayer-Miller firm has in its sales list a 5,000-pound capacity truck fitted with a stake body, having a carrying space 10 feet long and 53 inches wide. The truck is after the design of the Frayer-Miller touring car in that it makes use of a four-cylinder air-jacketed motor with the forced draught of air passing within the jackets. The motor is not of the same detail as that used in the 1907 touring cars, in that it uses two camshafts, whereas the 1907 motor has a single camshaft. In practically other respects the motors are alike. That used in the truck has four separately cast cylinders with 4 1-16-inch bore and 5⅛-inch stroke, the rating being 24 horsepower. Motor location is identical with that in the pleasure cars, being lengthwise in front but carried beneath the seat. Transmission is through an expanding clutch and shaft drive to a jackshaft in front of the rear axle and from this jackshaft to the rear wheels by side chains. The transmission, of the selective design, gives four forward speeds and one for reversing, all gained by one lever at the right end of the footboard. Three brakes are fitted, a clamping band on the transmission shaft and expanding shoes working within drums on the back wheel hubs. The running gear, designed with an aim to withstanding strains, has an I-beam front axle centrally dropped and carrying jaws for the steering pivots and the back axle is a square shaft 21-4 inches to the side. The frame pieces, made with good depth, are straight throughout and are supported on the axles by a double platform spring, one in front and the other in the rear. The fuel tank is on the left side of the dash and contains 13 gallons, the wheelbase is 112 inches, tread 66 inches, rear tires 5 inches wide and front tires 3½ inches in width. The truck complete weighs 3,000 pounds, and claim is made that it has a speed of from 4 to 16 miles per hour.

**Auto-Car Equipment Co.**

Of six commercial machines exhibited by this concern, two are new models for passenger service—one a ten-passenger electric brougham and the other a ten-passenger gasoline limousine car. The electric brougham makes a specialty of the use of Hess-Bright ball-bearings throughout and is propelled by two type 24 Westinghouse motors with current furnished from forty-two cells of a National battery. Drive from the motors is by Morse silent chains. The running gear comprises such standard construction as angle iron framework with axles of solid hand-forged steel, the front 2 inches and the rear 2¼ inches in size, the former carrying forged steering knuckles. Braking is through double-acting internal brakes located in drums attached to the rear wheels. Other brakes are on both motors. The controller, of the Westinghouse horizontal type, provides four speeds ahead and the same number for reverse, the range being from 3 to 15

miles per hour on level pavement with full load. In front and rear artillery wood wheels are used, the former 36 inches in diameter and the latter 42, and equipped respectively with 3½ and 4-inch solid rubber tires. The novelty is the variable tread, the measurement between the two front wheels being 62 inches and that between the rear pair 70. The wheel base is 100 inches. The running gear is of the reachless type with half elliptic springs in front; steering is by the worm type, with the steering gear coupled with a vertical column topped by a hand wheel. The new ten-passenger limousine, credited with a speed approaching 20 miles per hour on ordinary roads, differs from the majority of limousine cars of the present day in the use of 36 by 3½-inch solid rubber tires in front and similar tires 36 by 4 inches in rear. The ten passengers have seating space in the limousine or closed portion, which has a length of 8 feet and is trimmed throughout with imported cloth, the ceiling being lined with the same material and the floor carpeted to match. The power plant is one of the standard motors used during the present season in the large trucks of the company, and it has huge passenger brakes. This motor carries as its distinguishing features four vertical separately-cast cylinders, having inlet valves on one side and exhausts opposite, with both sets operated from the single camshaft. The cylinder dimensions are 4 11/16-inch bore and 5½-inch stroke. Strength has been aimed at throughout in this motor and the careful balancing and finishing of parts has not been overlooked. As an example of the strength of this motor it may be cited that the hammered nickel steel crankshaft has its main bearings 4½ inches long and its crankpin bearings 2½ inches long, while the bearings at the wristpin end of the connecting rod have a length of 3 inches and diameter of 1⅛ inches. All of the bearings are hardened and ground. Connecting rods are manganese bronze castings showing a tensible strength of 70,000 pounds. They carry phosphor bronze bearings at their upper ends and white brass bearings at the lower end. Ignition is by jump spark; lubrication is by forced speed to each of the crankshaft bearings, from which it is delivered by centrifugal force to the crankpins, and after passing from these falls into the crankcase, where it augments the splash that lubricates the cylinder walls. In transmitting flexible connection is through a leather-faced cone clutch in the flywheel and a three-speed and reverse sliding gear transmission with differential and jackshaft in the rear end. From the jackshaft side chains communicate with the rear wheels. Two sets of brakes, one internal on the rear wheels and the others operating on jackshaft drums, the latter for emergencies, are fitted. Spark and throttle control is beneath the steering wheel. In the running gear oak sills 7 inches wide and 2½ inches deep and armored with 3/16-inch steel plate are perferred to solid steel construction. The size of this framework is apparent from the length, which is 14 feet and the width 4 feet. Supporting this are forward side springs 42 inches long and rear springs of the same style 48 inches in length. These springs are in turn carried on hand-forged axles of square



FRAYER-MILLER STAKE TRUCK

cross section and measuring 2 inches to the side. Of the three machines carried over from the present season one is the twenty-four-passenger terraced electric observation car with a power equipment resembling that of the new electric brougham and with a running gear resembling that of the ten-passenger limousine. The other old vehicles are twenty-passenger gasoline brake, 5-ton gasoline truck, and 3-ton gasoline truck, the latter with varying dimensions; the 5-ton truck with 120-inch wheelbase, Timken roller bearings, I-beam front axle 5 inches deep and 2½ inches wide, 5 and 7-inch rubber tires in front and rear, 45-50-horsepower motor and oak framework with side sills 7 inches wide and 3 inches thick, reinforced with steel plate 7 inches wide and ¼-inch thick. The 3-ton truck uses standard roller or plain bearing, platform or rack body, oak frame and platform springs and is a massive-looking creation.

**Knox Motor Truck Co.**

Besides showing its type B, a 6,000-pound truck, in which the motor, transmission and rear axle are all housed together, this company has on exhibition the chassis of its new two-cylinder vertical, two-cycle delivery wagon. The motor, rated at 30 horsepower, has separately-cast cylinders with 6 and 5-inch bore and stroke respectively, and which give the rated power at 1,000 revolutions per minute. The intake of mixture is through the crankcase on the left, with a bypass in the side of the cylinders at the right, through which the mixture reaches the combustion chamber when the piston is on the lower part of its stroke. Instead of the mixture entering above the top of the piston it enters through the top of the piston. To do this the piston is made with a double top and openings in its side for the gas to reach the space between the tops, and then a central hole in the upper top through which it reaches the combustion space. There is one piston ring above the ports, through which the mixture enters. The power is transmitted through an eleven-disk clutch, having both sets of disks of soft steel and 11 inches in diameter. The clutch is accessibly housed in the forward

PART OF THE LINE EXHIBITED BY THE LOGAN CONSTRUCTION CO.

AUTO-CAR EQUIPMENT CO.'S VARIEGATED LINE OF COMMERCIAL CARS

compartment of the gearbox and the motor flywheel is at the front end of the crankshaft. The transmission is of the selective type, giving three forward speeds and one for reversing. It has the main shaft in the base of the case with the countershaft above it. Chrome nickel steel is used in all gears and shafts and Timken roller bearings are fitted throughout. Drive is by shaft, but instead of this shaft transmitting direct to the back axle through the differential it delivers its power through its bevel to a larger bevel pinion. On this large pinion shaft is a small spur gear in mesh with a large spur gear on the differential. The use of this double system is that changes in ratio can be quickly made; to facilitate this the differential housing is split angularly and with the upper portion off the changes of ratio can be made. Three brakes are fitted, one on the transmission shaft back of the transmission and the other set acting on the rear wheels. The company also shows a small runabout in which a similar motor is used. It is its intention to bring out a 20-horsepower Atlas runabout driving on this through shaft and planetary gear. Circulation in the truck and in the small runabout is by thermo-syphon, particularly large pipes being used. Ignition is by jump spark.

**Commercial Truck Co. of America**

A 5-ton truck, a thirty-passenger sight-seeing car, and a truck chassis comprising the exhibit of this concern are all of the electric type propelled by a set of four Imperial electric motors, one on each of the four road wheels. Current for these is stored in a large battery carried on a stout frame between the axles and underneath the car frame. Only the front wheels are used for steering, but should it be desired the rear wheels can be fitted with an axle support identical with that of the front axel and so used to assist in guiding the trucks. The front axle is a metal casting with a very large Elliott jaw at each end, there being room in this jaw for the inner end of the axle spindle and also the electric motor, so that in steering the motor turns with the wheel and for driving purposes is geared directly to the motor. The front and rear axles are rigidly braced to the battery support framework, by which means they are maintained in proper relation to the frame work and the half elliptic springs. These brace rods are provided with adjustment features. In addition to its four wheel drive these trucks are attractive as general service machines because of their wooden tires, the tire consisting of two rows of wood blocks covering the wheel rim and held in place by side flanges. These blocks have good wearing qualities and are replaced at an outlay of $25 per set. The 5-ton truck, weighing 5 tons and carrying 5 tons 200 pounds, has a speed of 7½ miles per hour, a wheelbase of 11 feet 11 inches, uses 36-inch wheels with wood tires 4 inches wide and takes its current from forty-two cells of battery with 300 amperehour capacity. The motors on the back wheels are carried rigidly on the axle. The steering is through a vertical column with hand wheel, and controller handle, and brake operating parts are conveniently grouped around the driver. The sight-seeing vehicle has seven cross seats, a canopy top extending from front to rear, glass front and side entrance steps between the wheels, and other short steps in front of the steering wheels. This vehicle carries solid rubber tires and like the truck in addition to an electric brake has clamping brakes operating on drums carried on the rear wheels.

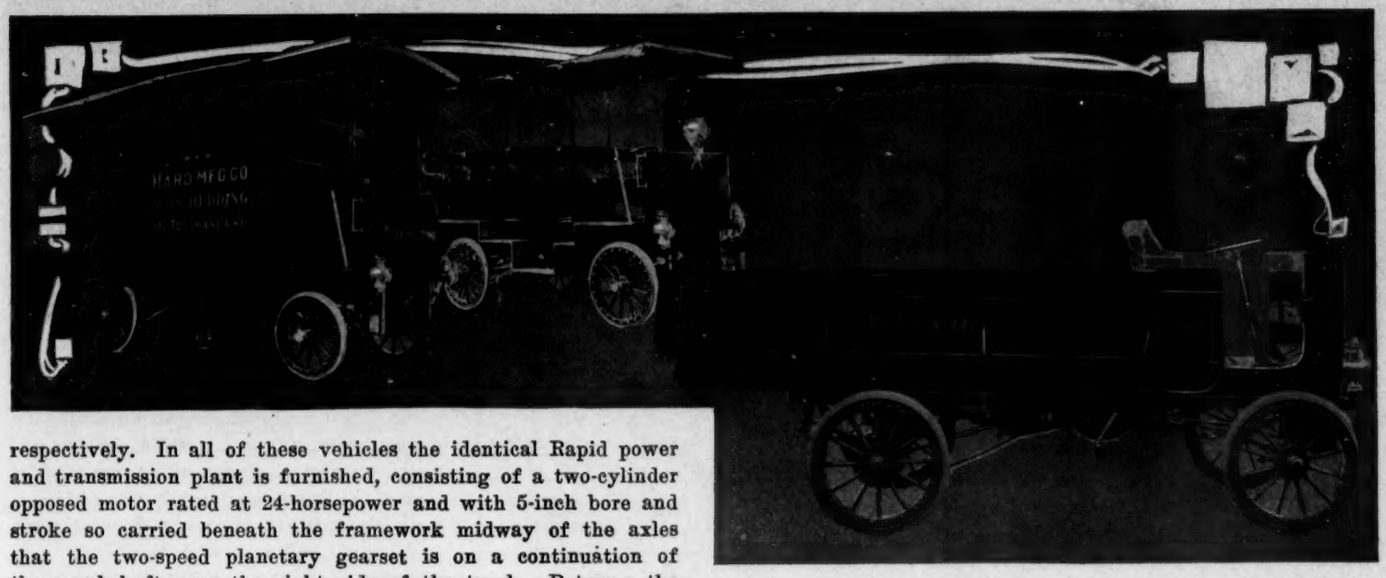
**American Motor Truck Co.**

A few principles different from those ordinarily employed in the 5-ton truck of today are evidenced in the American truck of this capacity, in which is used a heavy style of planetary gearset, providing for a couple of forward speeds and with a multiple disk clutch associated with this gearset. From the clutch the drive is by shaft to a jackshaft, carried well in front of the back axle, and from this shaft by chains to the rear wheels. Motor power is a 35-40-horsepower affair with 5 and 6-inch bore and stroke, respectively, and is built in either the two or four-cycle type with vertical cylinders placed lengthwise of the car or horizontal cylinders arranged in opposite pairs with the crankshaft between them. In the vertical cylinder inlet and exhaust valves are on the same side and mechanically operated, and the motor generates its rated power at 900 revolutions per minute. Motor suspension is through four brackets on the sills, on which rest the arms of the crankcase. Such tried features as float-feed carbureter, jump-spark ignition, force-feed lubrication, supplying a splash level in the crankcase, and motor control through spark and throttle levers on the steering column, as well as by ball governor, are in vogue. The chassis frame is of stout channel section supported by separate cross members; the wheel base is 9 feet 9 inches, tread 64 inches, flywheel clearance 23 inches, and the truck weight 8,000 pounds.

**Rapid Motor Vehicle Co.**

Of the six commercial vehicles forming the exhibit of this Michigan house, No. 1 is a 1-ton delivery wagon, No. 2 a 1½-ton stake truck, No. 3 a stripped chassis and Nos. 4, 5 and 6 commercial passenger vehicles for stake or sight-seeing purposes and with twelve, twenty-two and twenty-five-passenger capacity

COMMERCIAL TRUCK CO.'S SIGHT-SEEING VEHICLE

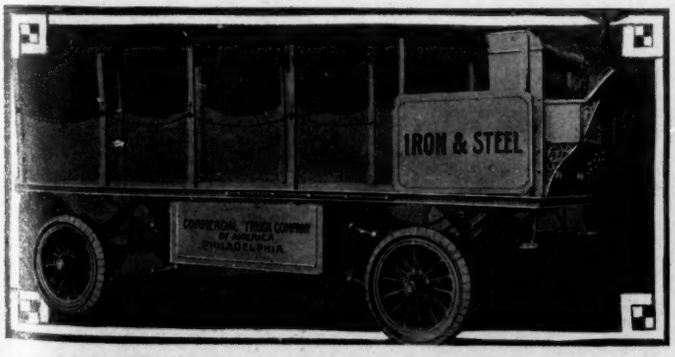


SOME OF THE MODELS MADE BY THE RAPID MOTOR VEHICLE CO.

respectively. In all of these vehicles the identical Rapid power and transmission plant is furnished, consisting of a two-cylinder opposed motor rated at 24-horsepower and with 5-inch bore and stroke so carried beneath the framework midway of the axles that the two-speed planetary gearset is on a continuation of the crankshaft near the right side of the truck. Between the motor and transmission is the sprocket for single chain drive to a countershaft carrying the differential and from which drive is by side chains. In all models a heavy angle steel framework, supported on platform springs in front and rear, is made use of. The motor has been improved in that it is slightly heavier, extra weight being required for the chrome nickel steel crankshaft, of increased diameter, as well as the connecting rods, also made heavier. Lubrication is improved by the use of a special oiler. A compact arrangement is effected by a straight dash, on the rear face of which is supported the water and gasoline tanks, the coil for ignition system and the storage battery. Of first importance also is the use of endless solid rubber tires fitted to all such models and succeeding the abutting-end, side-wire, solid tires used the present season, which have offered some difficulty when being removed and new tires fitted. These models are made with varying lengths of wheel bases.

**American Mfg. Co.**

A new face in the commercial car world is the Commerce truck, which is seen in New York. It is designed for carry 1½-ton loads and possessing in its makeup a 30-horsepower, vertical, four-cylinder motor in front, a flywheel cone clutch, three-speed sliding gear transmission with enclosed differential in the rear, and side chain drive with ⅝-inch one and one-fourth pitch Diamond chains. The motor, with its cylinders case in pairs and intake and exhaust valves side by side in the bottom of integral ports on the left side, where they are opened by direct lift from a single camshaft, differs from the average commercial motor in that its crankcase is a one-piece cast iron housing resting directly on a couple of dropped channel cross pieces of the main frame. The upper sides of these cross pieces are flush with the lower line of the side frame numbers. The left side of the crankcase is one large inspection plate so large that the camshaft with its half-time gears can be bodily removed through it and all adjustments made to the bearings of the crankshaft or connecting rods, and so when necessary the camshaft with all its parts can be removed without disturbing any of the other parts. Making the castings in one piece adds rigidity and having all parts accessible from the side eliminates the necessity of getting beneath the motor to make slight adjustments. In cooling a thermo-syphon system has been introduced in connection with the large-size radiator forming the front of the dash. Water circulation enters the cylinders beneath the exhaust ports and the return flow is from the tops of the cylinder heads to the top of the radiator. Standard construction rules in the jump spark ignition system as well as in the forced feed lubrication scheme, in which three tubes lead to the three Parsons white bronze crankshaft bearings and the fourth to supply oil level in the crankcase. In the transmission system, as well as in carrying the roadwheels, the use of American roller bearings in general is noted. They carry the four roadwheels, both shafts of the sliding gearset, and the inner ends of the drivingshafts of the jackshaft. The outer ends of the jackshafts, however, are supported in bronze bearings carried from the framework in a ball and socket device permitting them to rotate so as to relieve the countershaft of strains that might twist the car framework. The gearset operates on straight sliding principles and gives three speeds in one, all gears and shafts being of Midvale steel. Two sets of brakes are fitted, one comprising two clamping bands operating on the countershaft and pedal actuated and the other of the internal type expanding within 16 by 2½-inch drums on the rear wheels, the application of either set disengaging the flywheel clutch. Front and rear axles are made I-section from manganese bronze, the rear one straight from end to end, but the forward one centrally dropped. Steering is by worm and nut gear through hand whele on a vertical column and the wheels are of standard artillery type carrying solid rubber tires.




COMMERCIAL TRUCK CO.'S ELECTRIC

**Motor Truck Activity at Show**

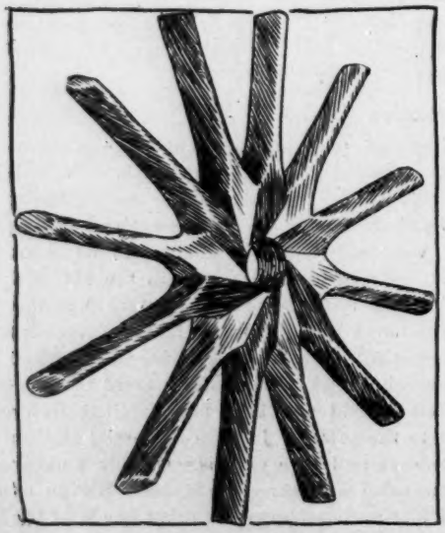
New York, Dec. 4—Special telegram—Although the commercial exhibit at the show does not compare with last year's, still the makers of the nine rigs which are on exhibition are not losing heart through lack of numbers. They are just as active boosting their game as if they were anything but a hopeless minority. One of the examples of their enterprise is seen in the Maxwell truck which has been rigged up as a moving picture machine, with the pictures thrown on a huge sheet in front of the rig. This in itself makes a great hit. Another illustration is furnished by the fact that a commercial truck has been impressed into service and before the show opened was kept busy hauling motor cars through the streets to the palace. In the commercial section there are nine complete cars and thre chassis. Of this number nine of them are water-cooled and three air-cooled. Eleven of them are equipped with four-cycle motors—the other one is of the two-cycle type. Business men show interest in this exhibit.

D2—2pp.

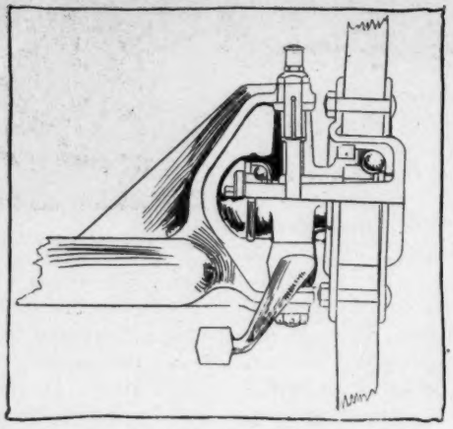
# PARTS AND ACCESSORIES

**American Ball-Bearing Co.—Axles**

The new front wheel hub brought out by this concern is best understood by a reference to its illustration, in which it is seen that the spindle carrying the road wheel is a part of the wheel itself and the vertical hub steering pivot held between the upper and lower jaws, of the Elliott type, on the axle end forms also a horizontal hub for receiving the wheel spindle. The inner flange of the road wheel hub is continued outward as a tube within the inner end of the wheel spokes and is formed integrally with the wheel spindle, which at its inner end is bored and receives a stud with finger wheel on its end, and by this stud both ball races of the hub can be adjusted as desired, a locknut retaining the adjustment. The steering pivot is suitably extended within the hub of the wheel to support the outer race of ⅞-inch balls, locating the balls not immediately beneath the center line of the spokes, but slightly more than ½ inch outside of this, and the inner race of balls is inside of the steering pivot. The balls in this race are of ½-inch size and placing the race in this position balances the wheel weight on opposite sides of the pivot and relieves the pivot of strain when turning, making steering proportionately easier. A hub cap is dispensed with by this construction and owing to this the company is prepared to furnish rear whels equipped with hubs to match. The bearings used are of the two-point bearing type, one of these points being on a cone ring carried on the hub



SCHWARZ WHEEL ASSEMBLY



AMERICAN NEW FRONT WHEEL HUB

of the steering pivot and the other a cupped ring carried in the wheel hub, these points being in a line of direction 45 degrees to the vertical. The new back axle is fitted throughout with these ball-bearings, two sets in the short pinionshaft, one at each side of the differential, and one race within each wheel hub.

**Schwarz Wheel Co.—Wheels**

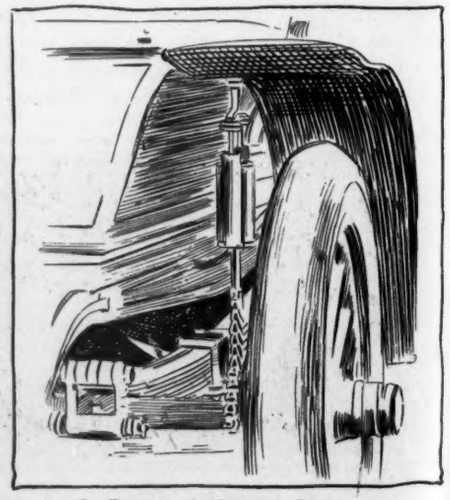
Wheels for both pleasure and commercial vehicles are shown by the Schwarz Wheel Co. The wheel has spoke support, the tenons interlocking. The spokes are put together at one time under pressure, each interlocking with its neighbor. In making the wheel no hub flanges are required in the operation as they can be placed as the wheel is being put on the axle. In praise of this wheel its makers claim for it that it always runs true; that it insures absolute spoke support; that its elasticity will protect the tires; that its strength is evenly distributed, and that the tenons of the spoke are longer than ordinary, permitting the use of a smaller hub flange on the Schwarz device.

**Baldwin Chain and Mfg. Co.—Chains**

Besides showing chains and sprockets the Baldwin Chain Co. displays the company's new patent compound spring suspension. Cork friction is used in place of leather and the cylinders are brass-lined in order to avoid being affected by moisture. The design and arrangement of these recoil checks permit the body of the vehicle to have a free and unrestricted movement up and down without the slightest check action within a certain area. The line of momentum of the body is not affected by the action of the checks. These checks are attached to the axle by means of a chain of new design. It is made of independent units which can be locked together, forming any desired length and which will clasp around any form of axle. Inside the brass-lined central cylinders is a divided piston covered with compressed cork which contacts with the side of the cylinder. A set of toggle arms butt against each side of the piston segments and a yoke over the top draws them down, being attached to the axle through the piston rod and chain. On each side of the cylinder is secured spring cases in which are located compound springs, which are attached to the body of the car so the combination between the body and the axle is a graduated frictional resistance in one direction combined with a spring action in both directions. This allows free motion of the car springs in both directions under ordinary road conditions, the idea the company had when it brought out the device and offered it for the consideration of users of motor cars who are recognizing the worth of the device.

**Wheeler & Schebler—Carbureters**

A new model of the Schebler carbureter, known as model E, is being shown by Wheeler & Schebler, the makers, in addition to the well-known model D and an assortment of parts, including a balanced throttle and a check valve for use in connection with the carbureter on two-cycle marine motors. The general principle of the Schebler carbureter is maintained in the new model, but whereas in the older model the fixed air inlet was a bypass alongside the auxiliary air valve, in the



BALDWIN'S RECOIL CHECK

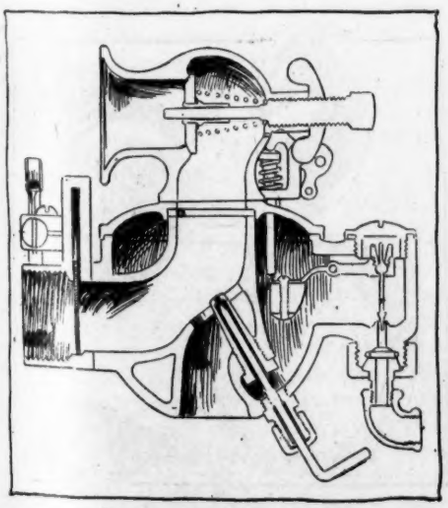
new model the auxiliary air valve has a place of its own on the top of the float chamber and the fixed air enters under the float chamber, a curved pipe projecting upward from the bottom of the float chamber so as to preclude the possibility of dirt entering the motor. The air enters the cylinder by passing entirely around the spray nozzle, which is still in the center of the chamber. The air which enters from the auxiliary valve passes downward, meeting the air from the fixed opening at the spray nozzle, thus being inclined to more thoroughly atomize the particles of gasoline before they enter the cylinder. All the other features of the Schebler are retained in the new model, whose appearanc is similar to that of the previous model. The makers advance the claim that the new model is very fast and is especially adapted for motors having high piston speeds.

**Avery Portable Lighting Co.—Gas Tanks**

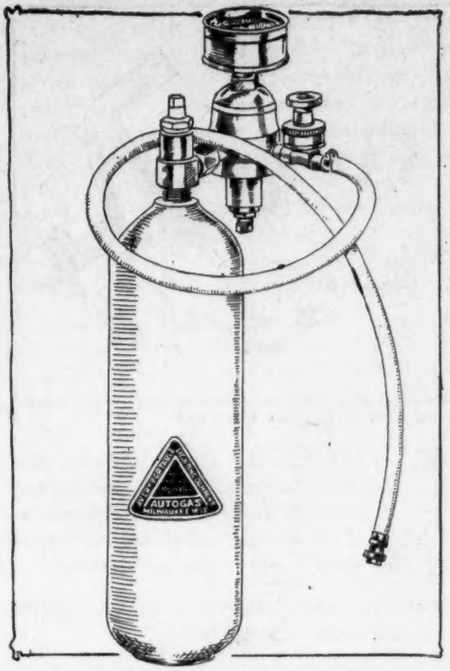
Autogas tanks in their several sizes are shown by this Albany company. The tanks are seamless pressed steel cylinders made in Milwaukee and are furnished in copper or nickel plating. They are charged with acetylene gas that is absorbed in enormous quantities by a chemical with which the tanks are first filled. No carbide or water is contained in the tank, yet the gas it not under very great pressure. At one end of each tank is a pressure gauge by which one can always tell the quantity of gas remaining in the tank. Metallic bands are provided for attaching the tank to the side of the car above the running board. Each tank, when fully charged, contains gas enough to last for 1 month with ordinary use.

**Sprague Umbrella Co.—Tops**

In the two styles of tops shown the newest feature is the new Sprague bows, which are made of tapered steel tubing filled with hickory and having forged steel bends brazed into their small ends. This construction makes the bows stronger and more durable than ever. Soft solid rubber blocks are firmly attached by metal clips



SCHEBLER'S 1907 CARBURETER




AVERY'S AUTOGAS TANK

to the bows near their upper ends to prevent the bows coming into contact with one another when the top is folded down, thus marring the varnish. The steel tubing is laminated and the wood extends on the inside all the way to the top and is cemented in. Although any material is used for covering the top, Colonel Sprague has made especially for his tops by the Firefield Rubber Co. a 32-ounce duck impregnated and sheathed with rubber and grained to imitate leather. This is varnished and is waterproof. One of the tops shown, mounted on a frame of bent tubing to resemble the form of a motor car body, is covered with this special material in black, while the other top is covered with russet pantasote.

**Lavalette & Co.—Magnetos**

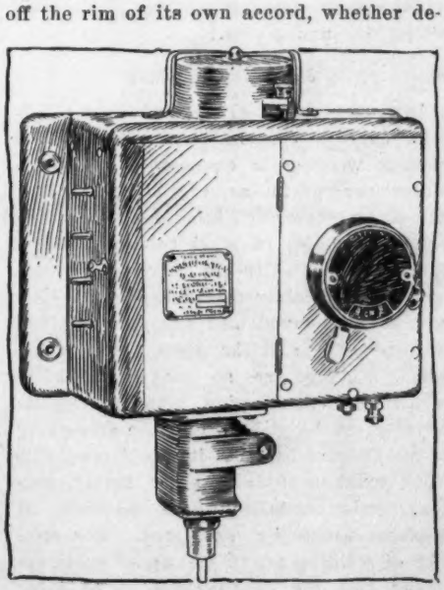
A line of the Eisemann high tension and low tension magnetos in various sizes and models as made by the famous house of Ernst Eisemann & Co., of Stuttgart, Germany, is shown by these Paris representatives, who hold the rights to the device in America and Great Britain. Lavalette & Co. also show the combined Eisemann-Carpentier coils in the induction or transformer model and the single trembler type with switch. The Eisemann magnetos, while remaining precisely the same in internal construction and dimensions, have been greatly simplified and refined in appearance for 1907 by removing the contact fingers and the rotating contact piece and inserting four contacts in the face of the instrument flush with the surface and rotating a single arm carrying the carbon that makes contact successively as it passes over the inserted contact pieces. Another refinement has been the adoption of an internal cam for actuating the contact breaker at the end of the armature. The outer periphery of this cam is circular and smooth, but the disk is cut away inside to form a cam that engages the arm which closes the contact breaker to complete the circuit. The points are separated automatically by a spring. This construction permits the magneto to operate at very much higher speeds than formerly, when the limit was about 1,800 revolutions. It works now at double that revolutions. It works now at double that.

**Broadwell Co.—Tire Tool**

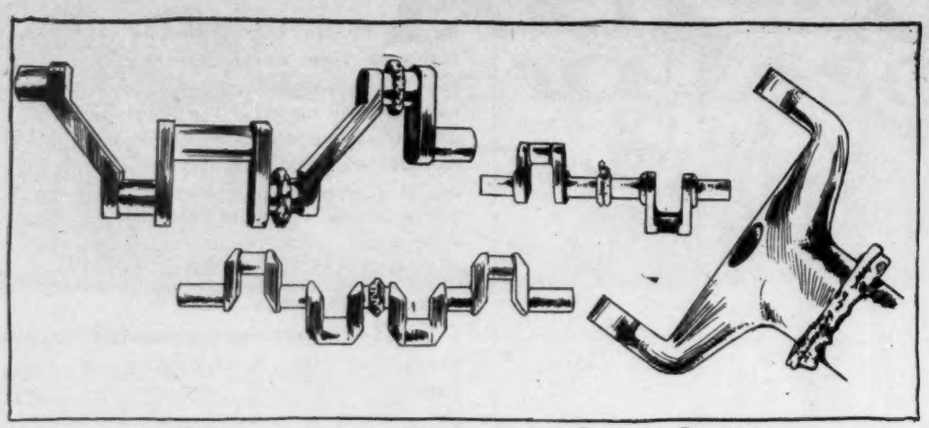
In the booth of the Contineutal Caoutchous Co., the demonstration of the Glidden tire tool manufactured by the Broadwell company, of Rochester, attracts an interesteing group of spectators. The most novel feature of this device is a group of three small cross-hatched steel rollers mounted in triangular heads and connected with one another by spur gears so they will rotate together. A shaft connected with these rollers passes through a steel handle and at its other end is attached to a folding crank. A special attachment is provided with the tool to first loosen the bead of the tire from the groove in the rim, after which the rollers are inserted between the edge of the tire and the rim. Upon turning the crank, the rollers are caused to rotate and by their respective movement they force the end of the tire tool along between the tire and rim, acting as a wedge to separate the two. The action is rapid and with the tool the operation of taking off a clincher tire looks easy.

**Fisk Rubber Co.—Tires**

Besides the well known line of tires in which the Fisk method of fastening is used, the Fisk Rubber Co. also has something new in a heavy car type clincher with a rat tread. The distinctive method of Fisk construction is the use of unthreaded washers, nuts, bolts and rings, which have been galvanized to resist the action of water and rust, to mechanically fasten the tire to the rim. For this principle it is claimed that a tire cannot come off the rim of its own accord, whether de-



ATWATER-KENT TIMER



SAMPLES OF ELECTRIC WELDING BY THE STANDARD COMPANY

flated or inflated, that it cannot roll or creep and that the inner tube cannot be pinched because it is stowed away and rests in a pocket and is completely surrounded by the outer case. There are three types of tires—the moulded, the heavy car type and the Bailey tread. On the heavy car type the tread, which is separately formed, is made with an extra amount of rubber, while there are three layers of fabric in the thread.

**Survey Map Co.—Maps**

Of interest to tourists is the stand of the Survey Map Co., which shows the official maps and routes of the American Automobile Association covering the states of New York, New Jersey, Connecticut, Rhode Island, Massachusetts, New Hampshire, Maine and the New York state line to Chicago. Maps are displayed in twenty sections of from eight to twelve maps to a section, there being in all 194 maps and ninety-five explanatory route cards in the complete set. The maps and routes are printed on bristol board 5 by 11 inches, the best roads and main touring routes being shown in red. Accompanying each set is a leather-bound case with transparent celluloid sides, which enables the tourist to keep in sight the map on one side and the route card on the other, while at the same time protecting both from water, dirt and grease.

**Standard Welding Co.—Tubing**

Interest in the exhibit of this Cleveland concern centers in the samples of electric welding in connection with such motor car parts as crankshafts, axles, camshafts, steering knuckles, etc., and also in samples of steel tubing. Crankshafts and car axles are on view in which the weld is plainly shown before the burr has been removed and also after it has been removed and the piece has been finished. There are so many places in motor car construction wherein electric welding can be utilized in place of cutting from the solid bar that it would seem this work must eventually enter freely into construction details where methods of economy are to be considered. The samples of welding are of almost all parts entering into the construction of a motor car, so also are the upsets shown. The Standard company also displays a complete line of seamless steel tubing and seamless steel rims of designs made for all forms of tires used in the motor car industry.

**Timken Roller Bearing Axle Co.—Roller Bearings, Axles, Hubs**

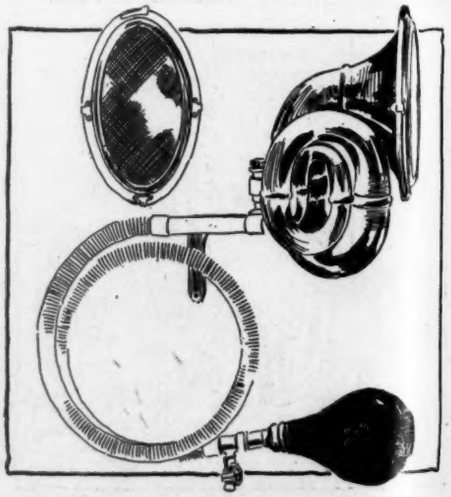
The house of Timken comes to the show this season with several novelties in roller bearings and shows samples of nearly every possible application of the Timken design. A steering knuckle of the Lemoine type, but made with some modifications, is shown, having roller bearings on both the steering pivot and on the spindle. The steering pivot is cut to form inside bearing surface, and between the axle extension and the pivot and two sets of rollers are steel bearing rings. No adjustment is necessary for the bottom rollers, as they adjust themselves as wear takes place, if there is any. The top ring of rollers is made adjustable by means of a cap, which screws into the axle end and over the pivot end. This, as well as a transmission, is shown only to illustrate how the bearings may be used, as the Timken people do not manufacture these goods. The transmission is of the selective type, with four speeds, and designed for a car fitted with side chain drive. Each end of the counter shaft is carried on roller bearings, the beveled ring being lodged against the case and the inside bearing being cut to a taper on the shaft. In the forward end of the case the main shaft is carried on two sets of oppositely-inclined bearings, inasmuch as this end of the bearing receives exceedingly heavy work. The forward end of the squared shaft has a set of roller bearings, as well as the back end, the bearings for the former being carried within a recess in the main driving gear attached to the motor shaft. The countershaft ends are carried on double bearings and as nearly in line with the sprockets as construction will permit. Each half of the countershaft is also supported on the inner end, next to the differential gear, on roller bearings. The Timken company also shows a line of tubular and I-beam axles for both pleasure and commercial cars and rear axles are exhibited in variety, including a new one for cars weighing up to 2,700 pounds when empty. Axles of the fixed hub and the floating clutch types are exhibited, as well as sections of bearings, axles, etc.

**Diamond Rubber Co.—Tires**

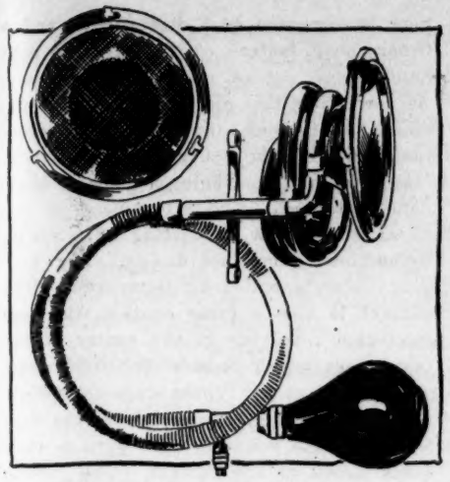
Diamond wrapped tread quick detachable tires designed principally for use on the Marsh rim, but fitting three other special rims, are being played up by the Diamond Rubber Co. The tire is of the flat tread type. Besides this the company has the Diamond wrapped tread tires of the regular clincher type with the flat tread, Bailey tread and the usual round tread. Then there are the Diamond wrapped tread tires of the Fisk type, the Diamond wire mesh base solid tires and the side wire solid tires.

**Charles E. Miller—Accessories**

Of course, Charles E. Miller's stand has his big line well displayed, one of the features being his line of imported motor car horns, two of which are new. One of them is No. 19, which comes in one size only, and the other is La Bassoon, an oval-shaped horn made from spun brass and polished. On this latter type there is a triple coil producing a tone deeper than ordinary. It has an adjustable attaching bracket, by which it can be fastened easily to any standard make of car which has round or square-cornered dashes. The French rubber bulb has been chemically vulcanized. There is a No. 16 horn of the same make which comes in three sizes and also has a triple coil and stationary bracket. On this the coils are placed around the bell part so that it is possible to carry the largest size of this type in a space measuring 4 inches. In addition to the horns Mr. Miller also shows to the public a jack, speedmeter and tire brackets. The jack is quick-acting and automatic and it is claimed it will lift 1-ton dead weight. The speedmeter works on the principle of centrifugal force, the entire governor mechanism being tool steel. One feature of the speed dial is that when the car is traveling less than 10 miles an hour the hand does not bob around or



MILLER'S NO. 19 LABASSOON HORN



MILLER'S No. 16 LABASSOON HORN

fluctuate. It also is fitted with an odometer which has two registers, the upper one a trip register and the lower one showing the total distance up to 10,000 miles, then repeating.

**N. Y. and N. J. Lubricant Co.—Oils**

Visitors at the booth of the New York and New Jersey Lubricant Co. find their interest attracted to a glass-encased transmission in operation, illustrating the advantages of a semi-fluid lubricant like the K-00 special. The company shows oil in all sorts and varieties—all non-fluid—and plays up its K-00 special grade, which is designed for lubricating motor car transmissions. The K-00 non-fluid oil, it is asserted, has largely supplanted greases for axles and differentials.

**Orlando W. Young—Specialties**

The cylinder oil displayed by Orlando W. Young is refined from the highest quality of Pennsylvania crude oil. The cup greases are solidified oils, known as plastic lubricants, being purely a mineral product and containing no lime, water or caustic soda. The gear and chain lubricant is described as genuine plumbago, mixed with a purely mineral grease of a very high melting point. Mr. Young also has a linseed oil soap for washing cars which is free from erosive solvents. The white thread waste he shows is of a long straight fiber which mats readily, is free from lint and is of great absorbent qualities. The rest of his line consists of Cox's patches for repairing inner tubes, plugging cement, shellac grip cement, rim cement and chain lubricant.

**Shelby Steel Tube Co.—Steel Tubing**

Efforts are made by the Shelby Steel Tube Co. to demonstrate how seamless tubing can be used in motor car construction and at the same time suggesting to makers new uses for it. Tubular stays and straight or tapered struts and distance pieces are designed for use in such plated fixtures as foot rails and bumping guards, because of the smooth surface seamless tubing. Then there are seamless tubular axles, while the same tubing is possible for use in telescoped rods and control rods, because it offers an even wall of straightness and strength, while it is applicable to all pipe connections because it can be annealed. It is also shown that this tubing can be used for exhaust piping to mufflers. One of the novelties shown is a seamless steel gasoline engine cylinder, unmachined—a one-piece construction with a thin wall for cooling purposes.

**Midgley Mfg. Co.—Steel Wheels**

Complete wheels of various sizes, together with sections of wheels to show the nature of the work entering into their construction, are shown by the Midgley company. There is little change in the construction for 1907 over that of previous years, although the company is now making, and has a sample on view, of a wheel made without a hub, so that a malleable hub can be bolted to the wheel in the same manner as this kind of hub is attached to wood wheels. It was given out at the show that the company's new building, erected to meet increased demands for Midgley wheels, covering 6 acres of ground, is in operation, all the new machinery being installed, so that the factory facilities are now such as to care for all the business that may be received.

**National Carbon Co.—Ignition Batteries**

Samples of Columbia sparking batteries comprise this exhibit, as well as coils and ampere meters which the National Carbon Co. makes for the trade. The line on exhibition includes a complete set of Columbia dry cells, the igniter dry cell, designed for motor car work, multiplex cells, and a new reserve dry cell designed as an emergency outfit for touring. The claim for this cell is that it will not deteriorate when not in use, so that it may be carried in a car an indefinite length of time and still do its work properly. The coils exhibited are designed with a view of being so wound and so constructed as to correctly form an ignition outfit with the batteries made by the company.

**C. T. Ham Mfg. Co.—Lamps**

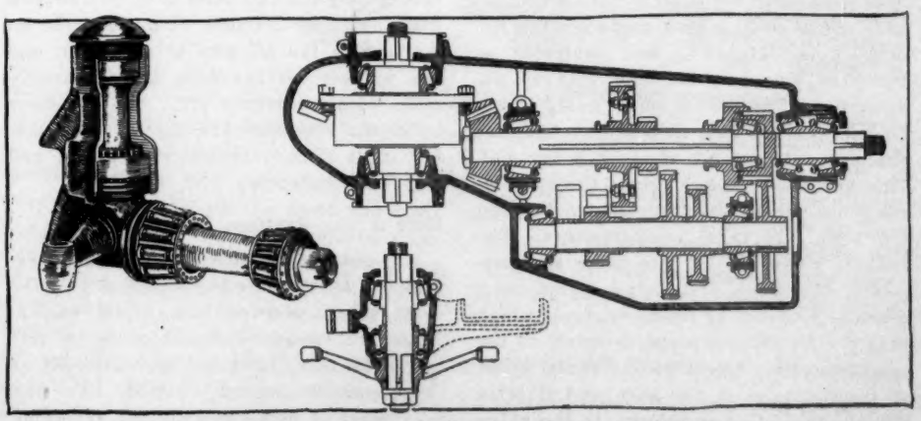
The new Tourist lamp shown by the C. T. Ham Mfg. Co. shows a difference over last year's model, the old corrugated lens being replaced with a combination lens which is made directly from the company's own moulds, the advantage claimed being that the flame can be seen through the plain glass margin, avoiding the danger of turning the light so high it will smoke. The difference between the Corona and the Tourist is that the former has a convex-concave glass lens. The Reliance, which is made along similar lines, has a heavy plate glass lens. The Aurora is about the same as this year while the Apex is designed for use on smaller cars, also having the new combination lens. In the Acme a heavy beveled plated glass lens is used in place of the recessed glass lens. The Monitor tail lamp is new and has the combination lens, while the Vigilant tail lamp has not been changed except that there is a beveled glass lens instead of a plain glass one. The safety bracket designed to prevent the tail lamp from being jarred off or stolen has a thumb screw which must be unscrewed and taken off entirely before the lamp can be removed.

**Continental Caoutchouc Co.—Tires**

Usually the Continental Caoutchouc Co. has something of interest to display at motor car shows, and this year is no exception. Of course, in the main the exhibit consists largely of the usual display of Continental tires, but this year the company has, in addition, a new anti-skid tire which already has made a hit on the other side of the Atlantic. In making this tire the company has been especially careful to put out something that will hold and to prevent the steel studs from becoming loose through an outside agency it has embedded these studs in the fabric and rubber during the process of manufacture.

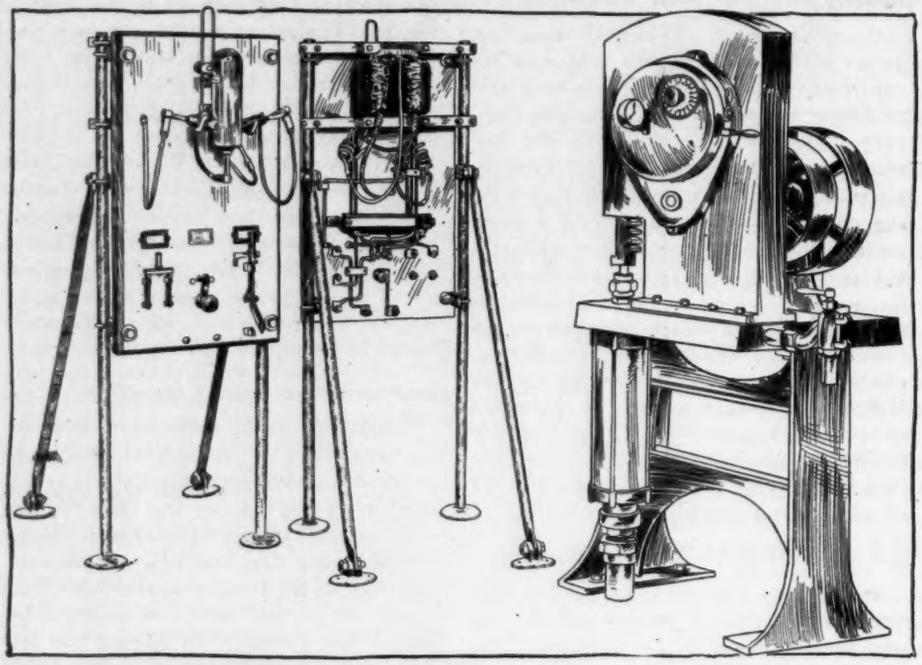
**Model Gas Engine Works—Motors and Gearsets**

This company shows a line of motors and transmissions, the former consisting of a double opposed and a four-cylinder and the latter of planetary and sliding gearsets. The opposed motor is fitted to a subframe, the pushrods passing through the frame members. The cylinders are 5 by 7 inches, rated at 24 horsepower. The valves are in the head and the pushrods are fixed to the rocker beams that actuate



TIMKEN ROLLER BEARING STEERING PIVOT AND GEARSET

the valves. The crankcase is cast in two parts, with an aluminum cover sufficiently large to permit a piston being removed through the top. The joints are made of the ball and socket type, eliminating necessity for packing. In the four-cylinder motor the cylinders are cast separately and are bolted to a crankcase that is made in two parts. In this motor the inlet valves are on the side and the exhaust valves in the top of the cylinders, all being actuated by a single camshaft. The timer is carried on a vertical shaft between the two last cylinders and operated by the camshaft. The pump gear is operated by the one-to-two gear on the mainshaft, this, as well as the camshaft gear, being enclosed by an aluminum cover. The planetary gear made by this company forms a portion of the opposed motor outfit, being also attached to the subframe that is supplied with the motor. The sliding gearset has three forward speeds and its principal feature is that there are no gears in mesh when on direct drive.



GENERAL ELECTRIC CO.'S ARC RECTIFIER AND BOWSER'S POWER PUMP

### Gabriel Horn Mfg. Co.—Horns

Instead of a multiplicity of tubes, the 1907 model of the horn made by the Gabriel Horn Mfg. Co., and exhibited at the show, has but one, and that of medium size. The device being small, it can be attached to the side of the body or else put entirely out of sight beneath it. This one tube, though, gives three different tones, which are produced by dividing the horn into three compartments. The exhaust gases are let into these compartments, the gases first being stored in a common chamber or reservoir, from which they are distributed proportionately to the compartments. There are no reeds, bulbs or fragile tubes in the horn and it is as flexibly controlled as before. In the valve controlling the exhaust gases one-half the bearing surface used this year has been dispensed with, which offers less surface for carbon accumulations. A free escape of the exhaust gases is permitted by the new cut-out valve, which has all three openings of the same size. The company will not discontinue the 1906 style of horns, but will keep on supplying the demand for the three and four-chime horns. The company also has a new cut-out valve, the outlet being of the same size as the inlet which fits the exhaust pipe, thereby allowing a free escape of the exhaust gases and preventing back pressure by the muffler. A piece of pipe may be attached to the outlet so as to lead the flame of the exhaust away from the frame of the car. The Foster shock brakes are also put out by the Gabriel people, the device consisting of a small, light cylinder, made of cold-drawn steel, with a piston attached. Oil is contained in the lower portion of the cylinder and the sudden compression of the spring forces the plunger down against the oil. As the plunger head comes in contact with the oil it forces it through eight small holes in the valve disk into the upper chamber, then, when the recoil occurs the oil acts as a cushion and the plunger returns with a slow, steady pull, which prevents jar. The oil flows back into the lower chamber, a small portion at a time, thus relieving strain and jar from the spring.

### Herz & Co.—Ignition Devices

All sorts of ignition devices are on exhibition at the stand of Herz & Co., the Herz timer perhaps being best known. There are twenty different types of this circuit-breaker, built on the principle of the patented snap-off contact. An improvement is noted in that the revolving part is composed of a steel sleeve and a bronze head, instead of the revolving part being made out of one piece of bronze. As now made, this piece revolves in a special drawn tube of hard bronze which eliminates wear. The contacts are now laminated, each lamina being a piece of Sheffield tool steel. The attachment of the wires is also new, consisting of a spring connection of original design. The Tangent timer is called an innovation. The contact is now a press contact, the tool steel cam revolving in the center of the instrument which presses two steel studs against each other. These studs are spring-pressed and when released from the cam they separate suddenly and give a very quick break of the current. The Bougie Mercedes spark plug has the connection to the current conducting the secondary cable made with a patented spring connection, which makes it possible to disengage the wire with a slight pull on the plug without loosening screw or nut. The company also exhibits French coils made by Louis Gianoli, of Paris, the B. B. pump, the Herz distributer and cable and wire terminals.

### General Electric Co.—Arc Rectifiers

This company shows a mercury arc rectifier panel for charging storage batteries, a garage panel for transforming alternating into direct current, and a set of switchboard panels for use when direct current is available. The rectifier consists of a mercury arc rectifier tube having a sufficient capacity to charge five ignition cells. The tube is mounted on a slate panel, with switches and rheostat. In one corner is a starting switch and in the other is the load switch, while between them is a small rheostat, arranged in series with the load so as to adjust the voltage between the limits necessary for charging from two to five cells. A direct current is used for charging storage batteries, and as most lighting plants use alternating current, some form of transformer is needed; then, when direct current is at hand, the voltage is so high as to require some heavy resistance where, usually, only from two to six cells of ignition are to be charged, so that the actual cost of charging is excessive. The rectifier is designed as a remedy for this state of affairs also.

### Pittsfield Spark Coil Co.—Ignition

The high tension magneto of the Pittsfield Spark Coil Co. uses no coil in starting, one-half turn of the crank being sufficient to produce the spark. A combination switch is furnished with a fiber gear with one of the teeth milled out, which is the neutral point. The contact point is set at different numbers of teeth from the neutral point, so when the car is left the combination is thrown off; when started again it turns either to the right or left of the neutral point the number of teeth on which the switch is set to the contact.

There is a dial with each switch showing how many teeth from the neutral point the switch is set on. This does away with the trouble of removing the switch lever and misplacing it. The company also shows the Jewell mica spark plug, for which a new terminal has been invented, which permits the use of the clip terminal or the thumbnut attachment, whichever one desires to use. The 1907 timer is built of aluminum, with solid steel arms and a hardened steel cam.

**Warner Gear Co.—Transmissions, Gears**

The Warner Gear Co. continues to manufacture its line of bevel and spur gear differentials and to exhibit the same. In addition it has brought out a new steering apparatus and transmissions of the sliding type that are fitted with both ball and roller bearings, the transmissions being otherwise exactly similar. The steering gear is of the worm and segment type, has a positive locking device and the spark and throttle rods are contained in the steering column and connected to the popular Mercedes type of levers on top of the wheel. The steering posts are made so as to give angles of 30, 42, 50 or 65 degrees. In the transmission sets the mainshaft and the countershaft ends are supported by single sets of tapered roller bearings in this type, but in the ball bearing type the forward end of the mainshaft section has a double set of bearings of generous proportions.

**Hyatt Roller Bearing Co.—Bearings**

Many of the cars on exhibition are fitted with the Hyatt roller bearings, but if one desires to examine into the details of construction he can find the material for his investigations at the stand of the Hyatt Roller Bearing Co. In the construction of this device it is possible to vary the nature of the rollers so it is applicable to all speeds and loads—a light flexible roller for light work and heavier and stiffer ones for heavier work. The flexibility of the Hyatt rollers is designed to give a full line of contact and there is no tendency to distort the metal of the journal or castings, which eliminates the necessity of hardened and ground surfaces, the company claims. The Hyatt roller also acts as a natural oil reservoir, while the right and left alternate spirals act as oil carriers.

**S. F. Bowser & Co.—Storage Outfits**

S. F. Bowser & Co. manufacture self-measuring pumps and oil storage equipments and a full line is on exhibition. The Bowser long distance gasoline storage outfit is well designed for the storage and handling of gasoline, a heavy galvanized sheet steel tank being buried underground, filled by means of a heavy metal filler pipe extending about 6 inches above the surface of the ground. In the filler pipe is an inner tube which extends to the bottom of the tank and is fitted with a very fine screen for straining the gasoline. A patent cap with a locking device is fitted to the filler pipe to prevent pilfering and meddling. It also is fitted with ball valve air vents to prevent evaporation. There is a gauge to show the amount of gasoline in the tank. Bowser & Co. also have a portable wheel tank and several other modifications of the original scheme. The Bowser automatic self-measuring power pump is designed to draw any kind of oil from the storage tank and is intended to be belted to a line of shafting, to an electric motor or to any other source of power. There is a gallon meter which registers all the oil pumped up to 5,000 gallons and then repeats. This device acts as a check on the supply and shows at a glance the quantity already pumped.

**C. F. Splitdorf—Coils**

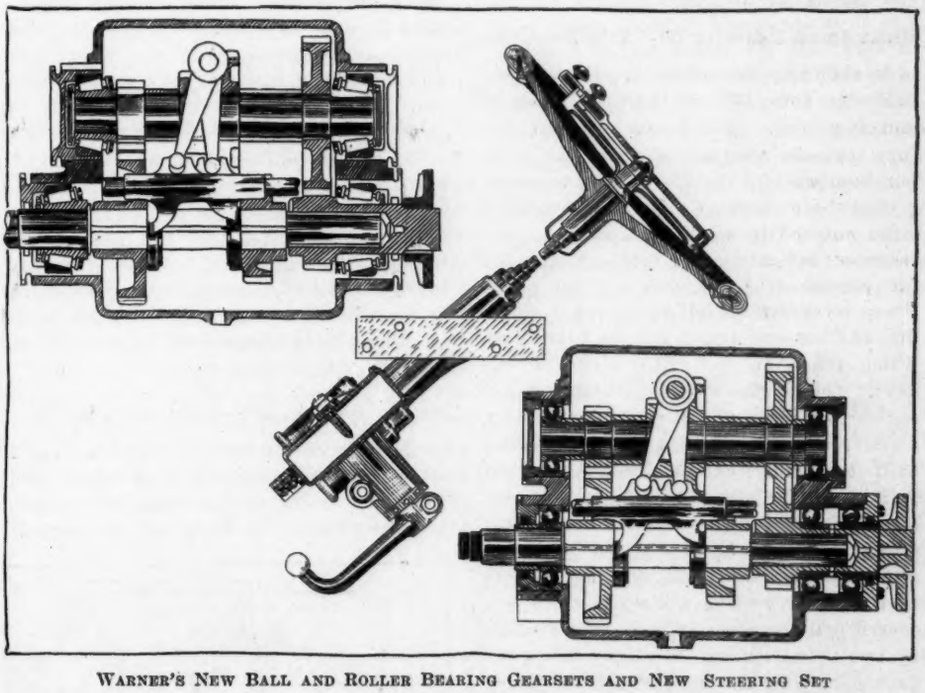
In addition to a new magneto, C. F. Splitdorf has coils and timers. A few changes have been made in the 1907 dash coil. The same unit type of construction is followed, using the Bogert hammer, the Bogert contact spring and the ratchet adjustment screw; but one thing noticeable in the way of an improvement to the working parts of the coil is a silent stop for the Bogert hammer, doing away with a considerable amount of the noise caused by the vibrations of this hammer. The general battery wire connecting the battery binding posts on the units and leading to the switch has been removed from the top and put inside of the case, the idea being to overcome any possibility of short-circuiting on the outside. Except that the material is thicker and heavier, the top of the box is practically the same as in 1906. Three styles of Splitdorf timers for the various number of cylinder engines are offered—the regular timer with the plain bearings, the snap point type with ball bearings and the roller contact type, also with ball bearings.

**International Rubber Co.—Tires**

Four types of tires are found in the booth of the International Rubber Co.—the International clincher with moulded tread, the clincher with the wrapped tread, the Bailey tread and the quick detachable with a wrapped tread, the last-named to be used on a special detachable universal rim. The wrapped tread tires are cured inflated, instead of deflated on iron forms, as is customary, while the moulded Bailey-tread tires are cured in one operation instead of being made in the usual manner—by semi-curing the carcass and applying the Bailey tread slip afterward, then finishing the cure by a second heat. The quick detachable is used without lugs and for it it is claimed that it cannot creep and that it can be taken off in 30 seconds without tools.

**Veeder Mfg. Co.—Odometers**

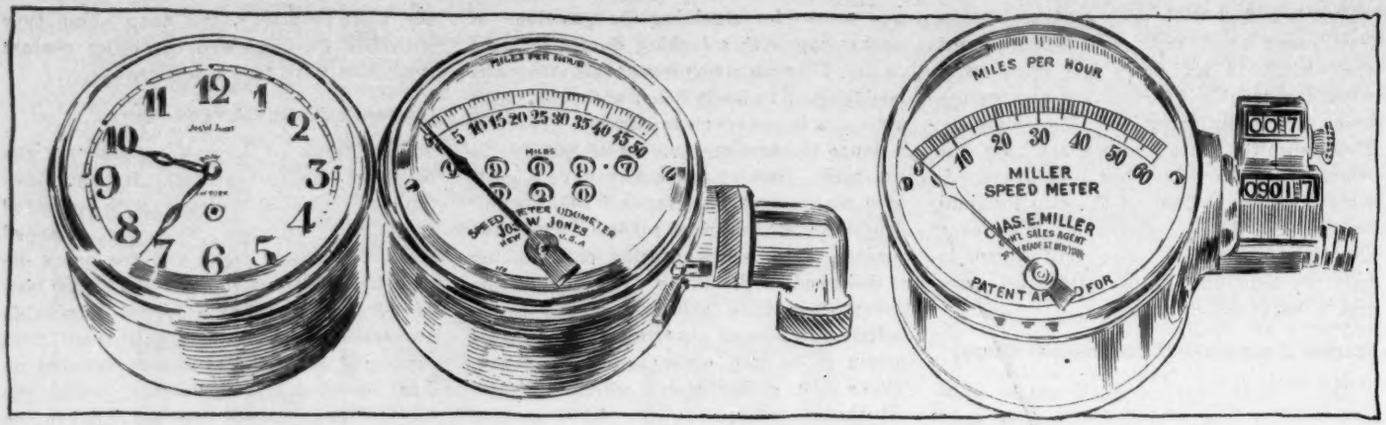
In addition to the Veeder form B odometer for steering arms and the Veeder form D odometer to go on the dash, each having a trip and total register, the Veeder Mfg. Co. is exhibiting a new tachodometer with a two-speed device. It has a 30-mile scale so the readings at the ordinary speed are large and plain. In case, though, the car is going over 30 miles an hour and up around 50, the tachodometer will register a 60-mile maximum by the driver throwing over a little lever on the side of the instrument.



WARNER'S NEW BALL AND ROLLER BEARING GEARSETS AND NEW STEERING SET

**American and British Mfg. Co.—Frames**

Various types of assembled motor car pressed steel frames of nickel, carbon and special alloy steel are shown by the Amer-




CLOCK AND ODOMETER IDEAS DISPLAYED BY JONES AND MILLER

ican and British Mfg. Co. Also displayed are pressed steel side and cross channels, pressed steel parts for the United States government field artillery, motor car frame spring hangers, hand levers and connecting rod drop forgings, hydraulic forged steel hubs for the United States government field artillery, a hollow caisson axle for the government field artillery, a chrome nickel four-throw built-up steel ball bearing crankshaft, and the Herreshoff four-cylinder 80-horsepower gasoline motor. The company also has on exhibition specimen sheets of carbon and nickel steel for frames, armor-piercing projectiles and special high grade forgings.

**Hicks Speed Indicator Co.—Trip Recorders**

As shown by its makers, the Hicks speed indicator for 1907 is radically changed and improved. In its new form it has four separate recorders showing the miles per hour from 1 to 75; a trip recorder, giving the number of miles and tenths of miles covered in a trip or a day; a total recorder, indicating the total mileage for the season or year, and a time piece. These recorders are all shown on a single dial and are enclosed in a 3 by 3-inch case which takes up but little room on the dash. The Veeder trip and total distance register or odometer is used in model D, while the speed recorder is the same as used heretofore except that instead of plain bearings ball bearings are used, designed to do away with the necessity for oiling, reducing friction to a minimum and relieving the load on the flexible shaft. For recording the speed there is a centrifugal governor, which is controlled by two spiral springs, the light spring engaging only on low speeds and the heavy one taking hold when a moderate speed has been reached. This device gives an evenly ruled dial and accurately shows the speed at rates of speed varying from 1 to 75 miles per hour.

**Whitlock Coil Pipe Co.—Radiators**

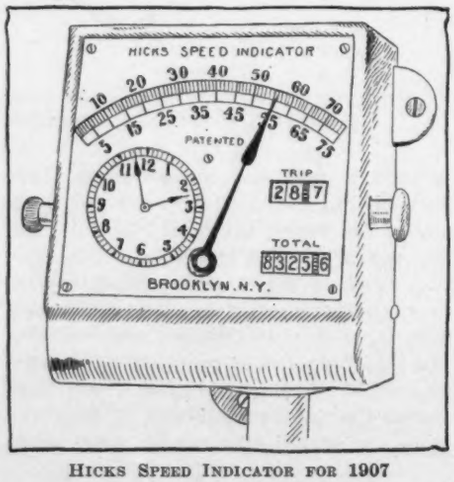
Samples of bent tubing, for motor construction, five distinct types of radiators, and a standard type of hood, make up the exhibit of the Whitlock Coil Pipe Co. The honeycomb type of radiator is a new one with this company and is similar in appearance to the Mercedes or Megevet types. Then there is the well-known cellular type and a tube and disk type. A fourth style is a tube and disk radiator for light touring cars, while the fifth one is a solid affair designed for use on commercial vehicles and heavy trucks. Exhaust and inlet pipes are shown, as well as a hood hinge, apparently a clever idea.

**Kinzie Mfg. Co.—Radiators, Oilers, Guards**

A very general and complete assortment of the radiators made by this concern is to be found at the Dayton company's exhibit. In addition there are mechanical oilers, pressed steel frame members, hoods, hood handles and fasteners, gasoline and water tanks, gasoline gauges, water and dirt separators, mufflers, fenders, drip pans and fittings. The Kinwood radiator is shown in a number of designs, such as are seen on many makes of American cars. A hood spring fastener generous enough in size to permit the finger to be inserted in the ring easily is among the new things brought out. A tank is shown that is fitted with a float gauge, which is devoid of mechanical complications and not very apt to prove misleading in its tale of the amount of fuel in the tank.

**Heinze Electric Co.—Coils, Distributers**

The Heinze Electric Co. shows, among other electrical appliances designed for use on a motor car, a combination coil and distributer. It is carried in a standard cabinet which has a partition separating the units. The commutator or distributer, which is placed on the front of the box, has a V-shaped revolving brush in the center, carried on a horizontal shaft which passes through the coil box and which is driven by bevel gear, belt or chain at the rear of the case. The four contacts consist of four opposing springs arranged in sets of two each. Contact is secured by bending the ends of these springs between which the V-brush passes, the spring tension being such as to tend to retain them in position. When the brush passes between them a slight separation takes place, but immediately the brush passes the spring tension forces the opposing pairs of springs together without consequent vibration, assuring contact for the next revolution. There is an aluminum cover for the commutator.




HICKS SPEED INDICATOR FOR 1907

**Rose Mfg. Co.—Lamps**

Neverout motor lamps and a patent inveritable safety gas producer are exhibited by the Rose Mfg. Co. The company has brought out a new searchlight, the Neverout combination focus searchlight, which throws a powerful beam of light ahead, while a secondary beam lights the roadway immediately in front of the car—a two-in-one combination—the long beam to bring out the curves and obstructions and the side one to cover the entire road. The 1907 oil side lights contain mirror lens reflectors, such as are found in the searchlights. Improvements have been made in the gas producer, one motion of the hand instantly generating gas, while another motion stops generation. No tools are required, everything practically being automatic. The new purifying arrangement prevents clogging of burners, while there is no gas confined under pressure.

**Electric Rubber Mfg. Co.—Tires**

New things on the stand of the Electric Rubber Mfg. Co. are the M. T. Triple Strength inner tube and the Traver blowout patch. In addition to these the company shows the Panther wrapped tread clincher casings and the regular red and gray inner tubes. The M. T. inner tube, it is claimed, has been tested to five times the greater gauge pressure than an ordi-

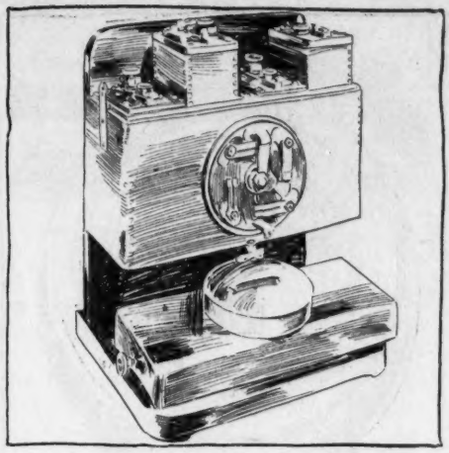
nary tube would stand. A feature claimed is that as it is possible to pump up the tube some before it is placed in the case the liability to pinch it accidentally is overcome. There is also a protection strip to overcome chafing on the rim. The company also says it will not elongate, common in tubes that have been stretched until they are too long so when put in a shoe they wrinkle, each wrinkle making an edge to chafe.

**Morgan & Wright—Tires**

The De Luxe flat tread tire is Morgan & Wright's novelty this year and along with it is the concerns' universal rim, which accommodates either clincher or Dunlop tires. This last device has an improved turnbuckle for 1907. The clincher is built along the usual lines and the fabric is so laid that it gives the same shape deflated as it naturally assumes when blown up. These are wrapped tread tires, wholly cured in open steam to prevent wrinkling. The Dunlop construction is well known, being held snugly to the rim by a group of non-elastic piano steel wires. The tire, held by these endless wires, is kept from expanding at the base by elliptical beads, one of which has a turnbuckle operated by a tool of lead pencil dimensions. Removing this bead releases the tire so it can easily be removed.

**Pennsylvania Rubber Co.—Tires**

Toughening the material used in the treads and a slight modification in the shaping of the tires in order to more evenly distribute the pressure, strain and wear make up the changes noted in the product of the Pennsylvania Rubber Co. Two additions to the line are shown—the Pennsylvania removable rim and the new Pennsylvania non-skid tire. The rim is fastened in a different manner than the French type and it is claimed that the change can be made in less than 2 minutes, including jacking up and letting down the car. The manner of operation in changing the rim is as follows: When a tire is punctured the wheel is jacked up and two bolts are loosened which extend through the felloe against the clincher rim. The tire and rim are then turned upon the wheel about 1 inch in order to



HEINZE COIL AND KNIFE COMMUTATOR

disengage the detents from the slots in which they rest, and the rim then slides easily off the wheel. An extra rim with its tire ready inflated replaces the one removed, the two bolts are tightened and the car is ready to proceed. The punctured tube, of course, is repaired at the end of the run, to in turn be carried in the spare tire. A special short valve has been designed for use on this rim and the security bolts are held by thin flat nuts. The Pennsylvania non-skid tire has on the tread rows of hardened steel rivets extending through a strip of specially prepared leather into the rubber of the tire. These steel studs are held firmly in position by several layers of fabric, in which their bases are imbedded, and by the leather holding the heads securely.

**Hartford Suspension Co.—Suspensions**

To look at the new Truffault-Hartford friction shock absorbers one does not notice that it is much different from the 1906 type, but the improvements are there just the same. In the first place it automatically lubricates itself and the movement is on a straight line between the frame and axle because of the way it is attached to the car. Of the 1906 principles, it is noted that there is still the three-point frictional device, two arms being paired and joined to the outer end by a single stud. At the frictional bearing they are separated enough to permit the interposition of the third member. Between the two outer sections and the inner one is a pair of frictional washers and the arms are as usual made of crucible steel, the split locknut clasping and offsetting the five-pointed spider washer which binds the moving parts together, thus maintaining a constant tension upon them. The resistance of the device remains constant, as this spider washer keeps the degree of tension equal and automatically disposing of any wear. As all the arms are equal, the suspension is uniform and rights and lefts are not made by the Hartford company.

**Diezemann Shock Absorber Co.**

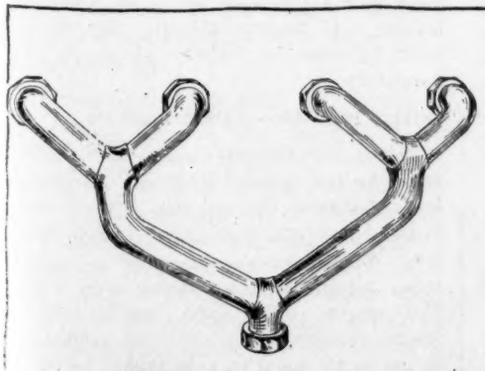
While the Diezemann Shock Absorber Co. has nothing entirely new, still it has an interesting exhibit, consisting of one large model for cars over 1,800 pounds and one small model for cars under that weight. In comparison with the 1906 models it is noted that the casing is made heavier, to prevent breaking due to the torsional strain, and that the reservoirs for grease are made larger. The absorbers are adjusted at the factory and are designed to go without attention for at least 10,000 miles. The tension of the large absorber is now set at about 45 pounds and the small ones at about 38 pounds.

**Edmunds & Jones Mfg. Co.—Lamps**

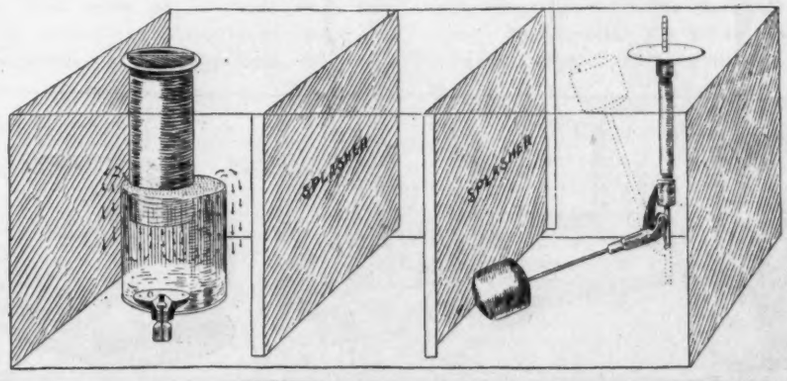
The leading feature of the No. 6 lamp, put on the market for 1907 by the Edmunds & Jones Mfg. Co., is the extension flare flange design. The company is using a 1-inch larger mirror for the same size flange surface, it claims, than others, and asserts that the flare flange is superior to the straight barrel type lamp in that the front reflector is properly focused on the mirror in the back of the lamp, thereby getting the assistance of the front reflector. The company had a flare flange last year but it was only based on a metal reflector alone, while the condensing lens assisted it to a certain degree.

**Harburg Tire Co.—Tires**

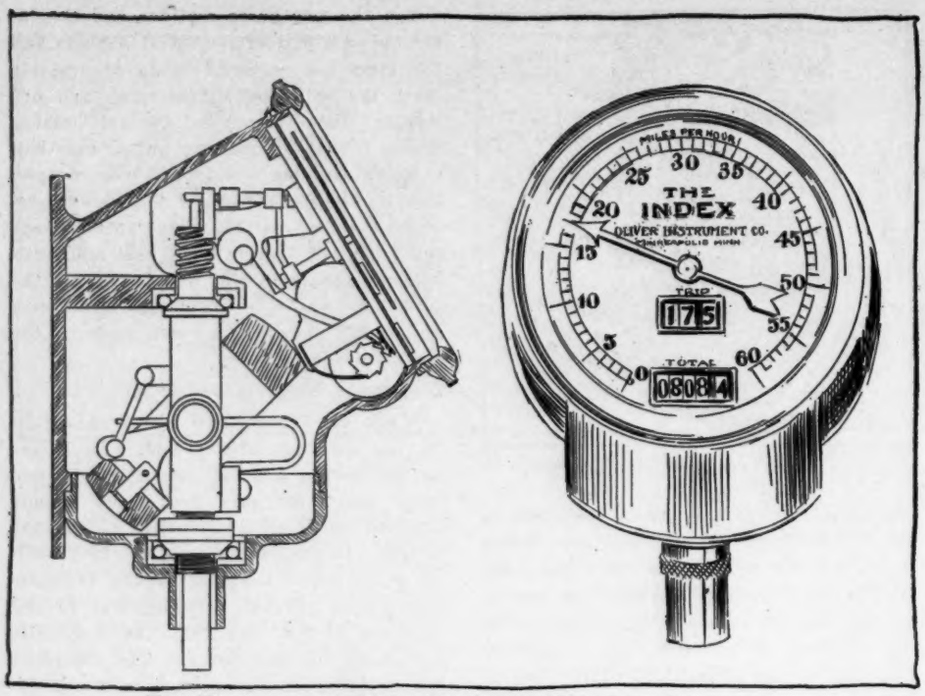
Among the several concerns showing a detachable rim is the Harburg Tire Co., which has the rim of the wheel provided with a beveled bed, with the felloe pierced at regular intervals by six bolts. The rim fits over the bed, the turning of the nuts



WHITLOCK PIPING




KINZIE MFG. CO.'S GASOLINE FLOAT GAUGE

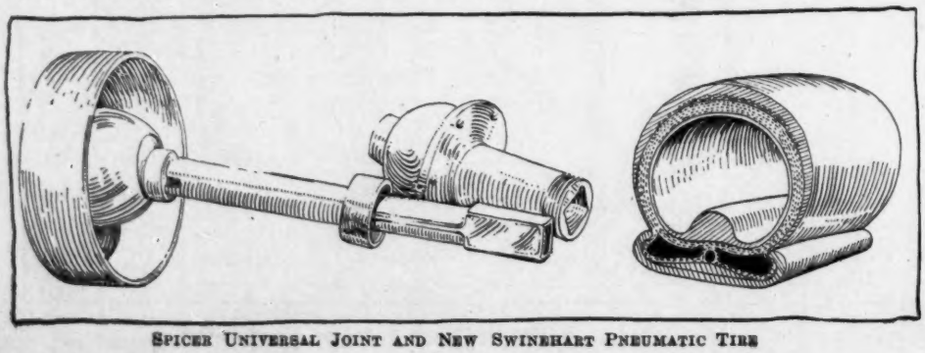



TWO VIEWS OF THE OLIVER INSTRUMENT CO.'S SPEED INDICATOR

on the bolts tightening the hinged clips against the rims on the bevel, the idea being to secure a tight fit without the possibility of shifting or creeping. The overhang of the clips and the nuts holds the rim in place. Two nuts are enough to hold, although six are provided. The rim requires no special valve construction. A novelty is a wrench that works like a brace and bit, with a magazine for the nuts. This bit picks off the nuts and holds them in the magazine. The rim off, it is an easy matter to replace it, a few turns of the wrench putting on the nuts. The rim is of cold rolled steel throughout, the bolts are drop forgings, the clips case-hardened and the nuts made of Tobin bronze.

**Oliver Instrument Co.—Speed Indicator**

A new speed indicator, the invention of E. C. Oliver, professor in mechanical engineering at the University of Minnesota, is shown by the Oliver Instrument Co. The indicator, called the Index, is of the mechanical centrifugal type. A vertical spindle carries a brass ring, or weight, which lies in an inclined position close to the shaft under normal conditions, but which, under the influence of speed, tends to assume a position at right angles to the shaft. The motion of the weight is restricted by a spring bearing on a cam surface attached to the weight. When at rest, the spring bears on a cam near the center of oscillation, but as the speed increases and the weight tends to move toward a horizontal position, the cam rocks on the spring, throwing the point of contact away from the center of oscillation, and thus always proportioning the strength of the spring to the force of the weight. This construction accomplishes two results. It causes the weight to swing through equal angles for equal additions of speed and allows the dial to have equal graduations throughout the range of the instrument, without a complicated mechanism between the weight and the indicating hand. Again, at any speed, the weight has an equal power for moving the indicating mechanism, and friction will have less effect on the accuracy of the instrument. The spindle is mounted on ball bearings, and the pivots of the weight are also ball bearings, so the friction is reduced to a minimum wherever possible. The instrument carries a trip and total odometer of the Veeder type, and the readings show through the main dial. The trip record is set back by a button at the side. The mechanism of the odometer is driven from the spindle by a worm and ratchet arrangement, so the readings add, whether the shaft rotates forward or backward. This feature allows the instrument to be driven equally well from either front wheel. The dial of the indicator is 2¾ inches in diameter, and the graduations extend around 5/6 of the circumference, allowing about ⅛-inch for each mile. The hand of the indicator is free from vibration. The case is attached directly to the dash of the car by brackets. The spindle being vertical, can be placed through the footboard in a very convenient manner. The shaft is of the universal link type, made from steel, ¼-inch in diameter and case hardened.



SPICER UNIVERSAL JOINT AND NEW SWINEHART PNEUMATIC TIRE

**Connecticut Telephone and Electric Co.—Electrical Supplies**

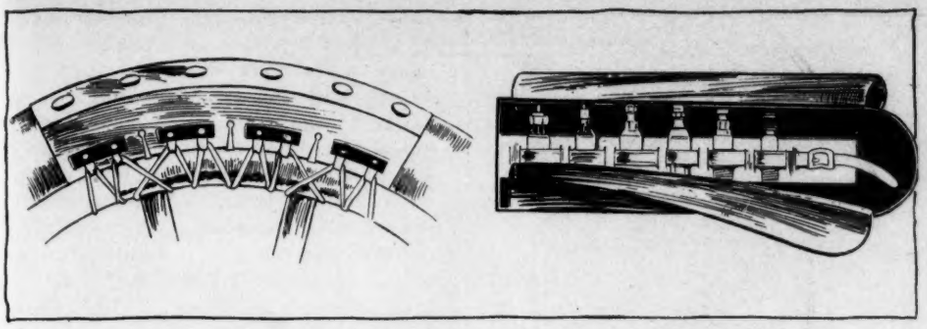
Spark coils, indicators, meters, switches and a new timer and combined timer and distributer make up the display of the Connecticut Telephone and Electric Co. The spark coil is constructed on the unit system, the units being interchangeable and self-contained. The vibrator has contact points made of iridio platinum, while it is adjusted by a simple turn of the adjusting thumb screw, which is self-locking, as is the contact screw on the bridge. All connection posts for both primary and secondary circuits are made on the bottom of the case, while the secondary connections are mounted on hard rubber on the units and cases. The type L switch is one of the lock type with a removable lever, which can be carried in the pocket, and on the back edge is a soft rubber gasket to prevent water running down the back and causing a partial short circuit of the wires.

**Whitney Mfg. Co.—Chains**

Driving chains for motor cars, bicycles and machinery, keys and cutters for the Woodruff patent system of keying, and Presto chucks, collets and friction-tapping devices for the rapid change of drills, reamers, taps, etc., without stopping the spindle of the drill press make up the exhibit of the Whitney Mfg. Co. The company has made practically no changes in the sizes and styles of its roller chains, claiming that its standards for dimensions have been adopted by nearly all American makers. It asserts, though, that it has made advances in the way of quality and durability.

**Gilbert Mfg. Co.—Fabric Supplies**

Fabric supplies make up the exhibit made by the Gilbert Mfg. Co. The laced style fastened Gilbert tire case is well known, but the wire-edged fastening is new. The tube case is designed to protect spare tubes, while something new is the tire sleeve made from tough mineral chrome leather, which enables a temporary repair to be made in case a shoe is badly ruptured. Three styles of spare tire holders are shown, No. 60 being for carrying the spare tire at the back of the tonneau,



ONE OF GILBERT'S TIRE CASINGS AND SPARK PLUG CASE

on the torpedo stern or at the side of a runabout. Nos. 70 and 80 have bracket pieces, one for fastening to the dash and the other to a flange under the seat, and a running board piece for holding the bottom of the tire. The shafts of the arm piece which go in the brackets are made extra long, enabling the tires to be held in the most desirable position. Besides these there are tool rolls, tool kits, steering knuckle and universal joint boots, spark plug cases, starting handle holders, sleeve protectors, leggings, rubber covers, slip, covers, storm aprons and lamp covers.

**Warner Instrument Co.—Auto-Meters**

One new instrument is exhibited by the Warner Instrument Co., an anemometer, which has been adopted by the United States government for determining the velocity of the wind. This instrument is shown in actual operation. The company also has several of its other instruments in operation which shows the accuracy of the readings at various speeds. The company also displays a complete assortment of fittings and of all the internal parts, both assembled and unassembled, so it is possible for the spectators to investigate for themselves the internal mechanism of the instruments. The Auto-Meter which the company makes a leader operates independently of levers, cams or joints, magnetic force directly applied being the motive force. The indicating dial is directly influenced by a magnet revolving on ball bearings, the dial being mounted on a pivot whose ends ride in sapphire bearings, such as are found in high grade watches. There is nothing intervening to interfere with the magnet's influence upon the dial and the latter, calibrated by machinery specially designed for the purpose, reads evenly the entire length of its large, readable, 6-inch scale.

**Spicer Universal Joint Mfg. Co.—Joints**

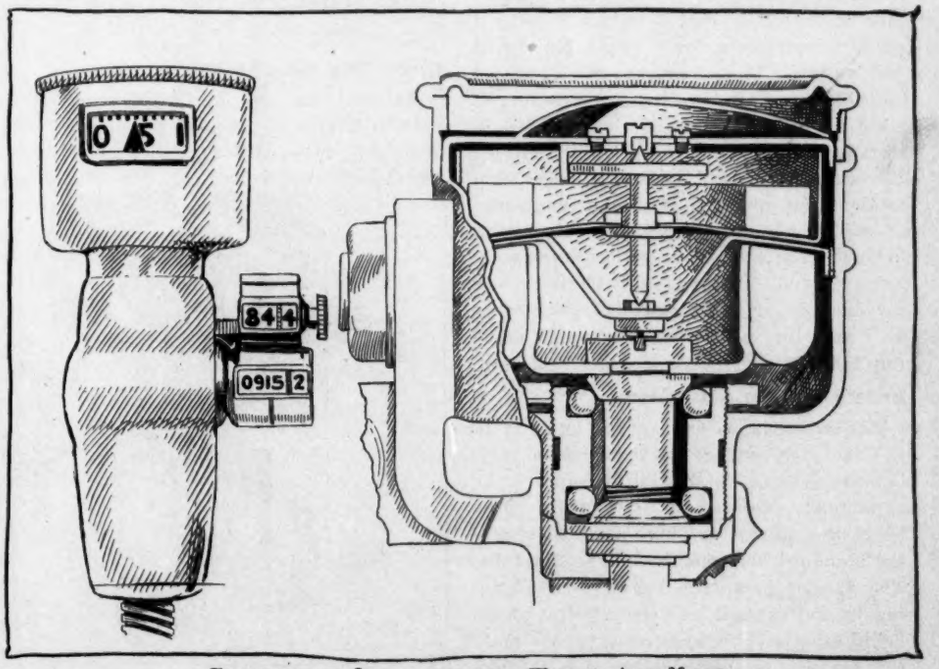
In putting out its 1907 product the Spicer Universal Joint Mfg. Co. has found it necessary to make several important changes in the casings of its universal joints. These changes were made necessary because the company found that in practice many users of motor cars pay no attention to the necessary slight adjustments which keep a machine in running order. It was discovered that the practice was to neglect to renew the packing in the universal joints, when it became worn, the result being that particularly in wet weather more or less slush and grit worked into the interior of the joints. As shown at the company's stand, the 1907 model has an outside casing added on the rear joint. It fits tightly, metal to metal at the hub, so whenever slush runs down the shaft or is caught by the casing it will run off either by gravity when the car is standing or by centrifugal force when the car is under way. Two grease cups have been added to the slip joint, which will, if used by the driver of the car, lubricate this important bearing and which also will remind the driver that he is expected to attend to this detail. The company is also bringing out a new spark generator which has been tested for 3 years on the road. It is simple in construction—no moving wires, connections or contacts and generates a high tension current, so no spark coil is required. No vibrator, no spark contacts and no commutator are fitted and no batteries are required for starting or for emergencies, because the generator gives as good a spark when turning the engine over slowly by hand as when the engine is running.

**Swinehart Tire and Rubber Co.—Tires**

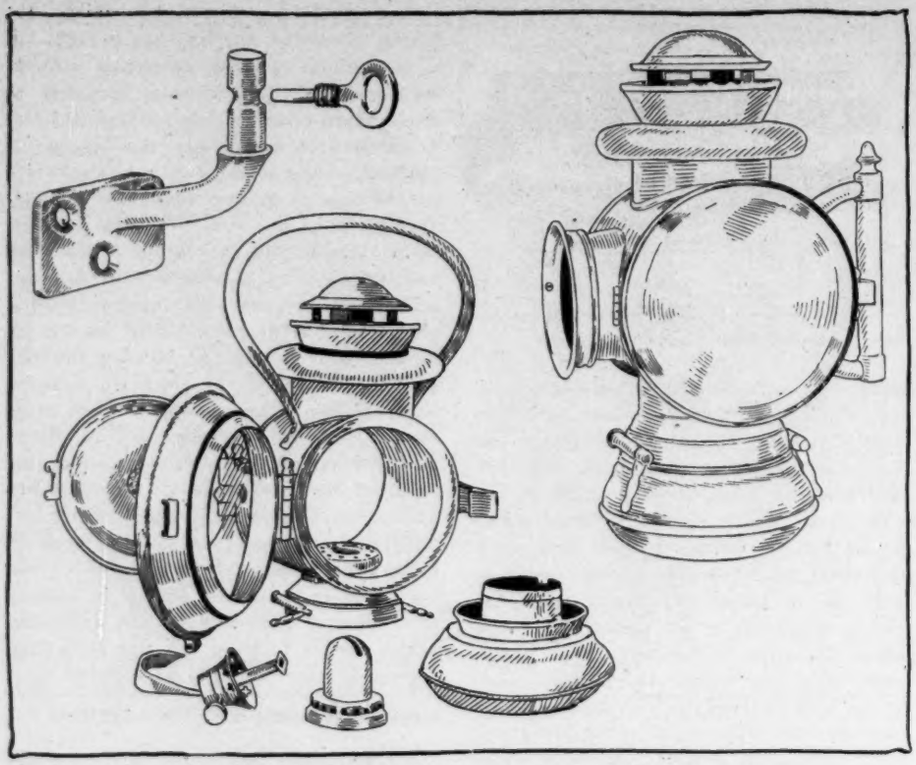
Heretofore the Swinehart tire has been of the solid type, used for both pleasure and commercial vehicles, but chiefly the latter. Now the company has brought out a single-tube clincher pneumatic tire, to be known as the Pyramidal, designed to fit standard clincher rims. Before the tire is inflated it buckles in the bottom of channel, owing to the fact that the width at the base is greater than the width of the inside of the rim. The tire is lined on the inside with a coat of self-healing raw gum. Any punctures that are not self-healed or cannot be repaired with a single tube outfit are repaired by the removing of the tire and slitting the tire open in the center of the base opposite the puncture. The opening is made large enough so that a patch can be placed on the inside of the tire, after which the walls of the incision, made with a sharp knife, can be cemented and the tire put back in the rim and inflated. The pressure being brought against the sides of a pyramidal rib in the center assists in holding the cemented joint secure. The pyramidal center serves to keep the tire from rim-cutting in case it should be deflated.

**Never-Miss Spark Plug Co.—Ignition**

Dynamos, battery connections, plugs, chain tools, coils and ammeters are on display in the booth of the Never-Miss Spark Plug Co. In the dynamo provision is made for either jump spark or make-and-break ignition, there being two windings, the two types being kept separate by painting the jump spark one red and the other green, the jump spark being of lower voltage. The device has self-oiling bearings made from anti-friction metal, with the brushes, liberal in size, so held in place that the wear upon the commutator is not noticeable. The governing is accomplished electrically and the dynamo runs equally well in either direction, all that is necessary to secure this result being to reverse the terminals on the field




EXTERIOR AND INTERIOR OF THE WARNER AUTO-METER



HAM'S NEW BRACKET AND SOME OF HIS LAMPS

coils. The voltage is from 8 to 15 volts, being regulated by a tension screw at the base. The Never-Miss spark plug is made of imported porcelain, the electrode and cup-shaped cap being made from one piece of steel. The construction is designed to take all jar from the porcelain. A neat little idea is the Handy chain repair device by which a broken chain can be drawn together and a master link put in without delaying the driver long.

**Gould Storage Battery Co.—Batteries**

On the stand of the Gould Storage Battery Co. are found samples and sections of plates showing the process of manufacture of the Gould battery which is intended to demonstrate their worth on trucks and wagons. Then there are the complete individual cells showing all the parts, which enables visitors to look inside a storage battery and learn the names of the different parts. Complete cells with sections cut away show the arrangement of plates and separators and supporting bridges. The company also has a complete tray of truck and wagon batteries ready for installation in commercial vehicles as well as a line of sparking batteries showing the different capacities and voltages.

**Briscoe Mfg. Co.—Radiators**

Radical changes are not to be seen in the radiator product of the Briscoe Mfg. Co., the general trend being to improve the appearance, design and strength. Two types are offered for high-powered cars—the standard honeycomb and the flat tube. The former is a true honeycomb, affording lateral as well as vertical circulation, being especially recommended by the makers for use on cars using the thermo-syphon water system. The company also has a number of types of radiators for low-priced cars and for trucks, while the accompanying hoods or bonnets show the company has kept abreast of the times. In fenders the large front ones designed for touring cars are generally equipped with extra wings to fill in the space between the fender proper and the frame. These wings are attached to the fender proper and the frame without the use of rivets by a special Briscoe process. The fenders shown are either plain or with a special fine black enamel. A three-pass cold rolled and leveled stock, capable of taking a fine finish under either enamel or paint, is used. Tanks, dustpans and dashes complete the line of sheet metal parts displayed.

**Oliver Mfg. Co.—Jacks**

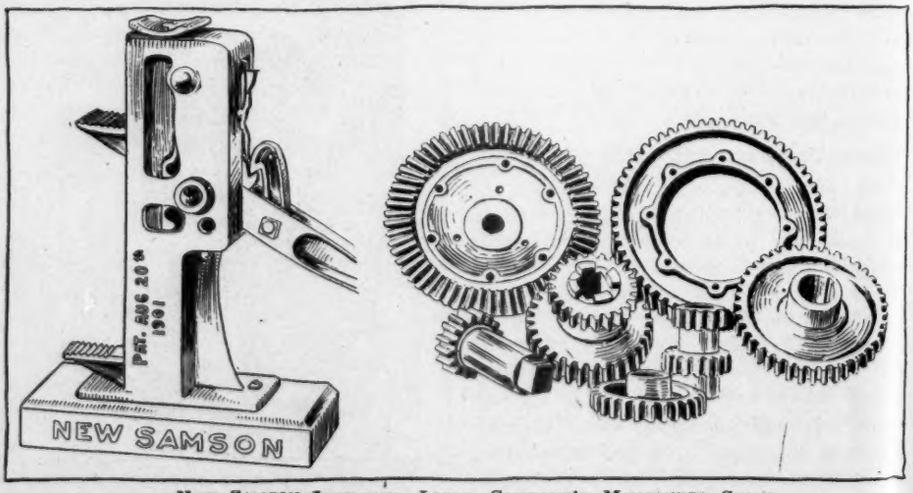
Three jacks are in the hands of the Oliver Mfg. Co.—one of them, the well known Peerless jack for touring cars, and the other two something new the company is offering for the first time. One of them is the New Auto Samson, which raises on the down stroke only and trips by throwing the handle to the extreme height. If desired it can be lowered notch by notch with the reverse movement without working pawls by hand, as with the other Samson jacks. An exceptionally large lifting range is secured by three brackets and the jack is adjusted to any height by raising the standard with the hand. Oliver's E-Z screw jack is designed for use on commercial trucks. The handle, having a half circle to engage cogs, can be operated at different angles, a feature that enables the jack to be worked under any truck. The cogs are engaged by a straight push on the handle. The Peerless works at any angle and is used for pushing as well as lifting.

**Goodyear Tire and Rubber Co.—Tires**

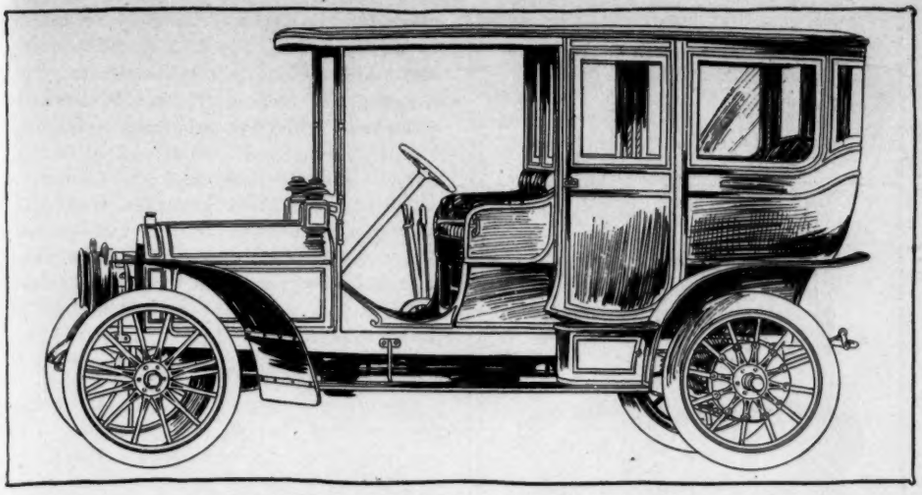
At least fifteen salesmen and demonstrators are busy on the stand of the Goodyear company, the salesmen ready to talk tires and the other chaps making their hands talk the merits of the wares they are demonstrating. Four styles of tires fitted to the Universal rim are on exhibition—the Goodyear detachable, the Goodyear solid detachable and the Goodyear clincher solid tire. All these are interchangeable on the universal rim. The company also is handing out an interesting little booklet on "How to Select an Automobile Tire" to interested spectators.

**R. H. Smith Mfg. Co.—Motometers**

Leading features of the 1906 Springfield motometer have been retained by the R. H. Smith Mfg. Co. It, however, has been improved in detail. It is a three-part device, a combined trip odometer registering to 99 9-10 miles and the cumulative odometer going to 9,999 9-10 miles. The simplicity of the device is one of its features. It is driven from beneath by a flexible shaft, while a vertical shaft rises centrally from bottom to top. A large gear is included in the driving connections, which meshes with and drives a small gear on the lower end of the flexible driving shaft, which is held in an adjustable bracket on the steering knuckle. A de-




NEW SAMSON JACK AND LIGHT COMPANY'S MANGANESE GEARS



EXAMPLES OF THE QUINBY BODY BUILDING ART

tachable clutch connects the upper end of the shaft with the spindle of the instrument. The controlling principle is centrifugal force, applied through the medium of the flyball governor. By the direct action of this governor the indicator is moved on the vertical dial which shows the speed of the car without the intervention of cams, links, retaining springs or any multiplying device. The flexible driving shaft is made up of thirteen strands of steel music wire wound in reversed layers, not woven. It is enclosed in a patent double protecting sheath. The odometer is worm-driven and is of the standard Veeder pattern. The Springfield is self-lubricating throughout, all bearings being provided with an ample supply of non-fluid oil. The flexible shaftcase is partly filled with non-fluid oil and the bearing of the pinion spindle on the lower bracket is provided with a compression oil cup. The flyball governor has a hollow spindle. Working within this is another spindle, the lower end of which is doweled to the sliding joint block. On the upper end the pointer is removably mounted so that as the flyballs are driven outward by centrifugal force, just so far the pointer rises on the vertical scale. As the pointer is raised against a spring resistance of more than 2 pounds at 25 miles and more than 4 pounds at 50 miles, and as the weight of the balls is under 2 ounces, steadiness of the pointer is assured, as well as uniform accuracy at all angles.

**William P. Miller's Sons—Oils**

Lubricating oils of all sorts are displayed by William P. Miller's Sons. The same line as displayed at the last New York show is again in evidence, as well as a couple of more oils—the Pan-O-Lite gas engine cylinder oil and a fiberous oil. The former, it is claimed, has a cold test 20 degrees lower than any other oil on the market. Another assertion made is that it will not carbonize.

**Wray Pump and Register Co.—Pumps**

In the National pressure register displayed by the Wray Pump and Register Co., a slight change is noticed, the body having been reduced in size and the small parts made so they are not liable to get out of order. The gauge, too, is of an improved pattern and so arranged that the operator can read it no matter in what position it is placed on the tire. The device is intended to show the air pressure in a tire. Besides the register the company is showing the Kellogg, Jr., pump, a new compound tire pump brought out by G. W. Kellogg, president of the company. It is of the two-step compression type, all the work being done on the down stroke. There are no hollow piston rods to create friction and no interior check valves to burn up and cause a leak.

**Hartford Rubber Works—Tires**

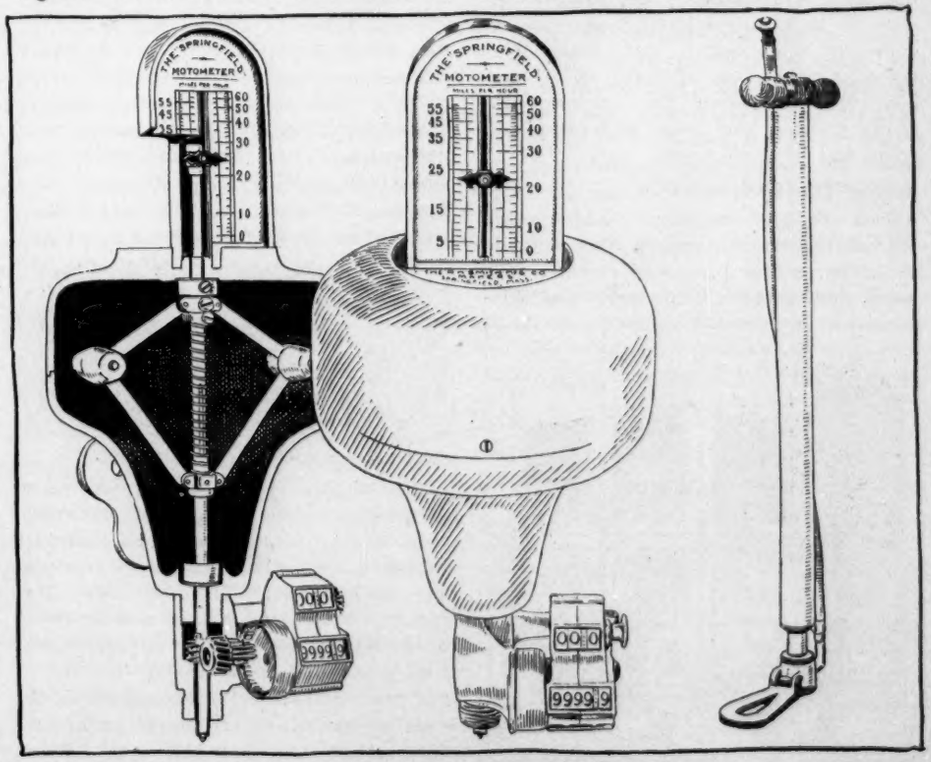
A number of distinctively new features are in evidence at the stand of the Hartford Rubber Works Co., among them being the new turnbuckle for Hartford tires and fitted regularly to all Hartford universal rims, taking either Dunlop or the clincher type of tires. The new square-end crank wrench takes the place of the former round-end key in the turnbuckle. This little device not only facilitates detachment and attachment, but the detachable ring is tightened and held with positive accuracy. Something new in the way of solids is a spiral wire base tire for commercial rigs. This type of tire is also fitted with the wire anti-skid tread. The wire grip, flat tread, non-skid, pneumatic tire makes its first appearance in public, although it has been used on demonstration cars. This device is designed for heavy wagons, the claim being made that it will not skid at speed on slippery pavement or in the mud.

**J. M. Quinby & Co.—Bodies**

A Matheson, S. & M. Simplex and a Fiat are in the booth of J. M. Quinby & Co. for the purpose of illustrating the body workmanship of the concern. Both the Matheson and Simplex have four-bow extension tops, but the colors and upholstery differ entirely. On the 35-horsepower Fiat is a limousine body, with a complete electrical equipment inside, including several novelties. All three cars have extra seats. They face forward and appear comfortable and luxurious.

**Atwater-Kent Mfg. Works—Generators**

In working on the 1907 model of its spark generator the Atwater-Kent company made it a point to improve on the accessibility. As it is shown in the palace along with the concern's regular line of pocket meters and battery testers, the spark generator consists of the entire ignition, except batteries and plugs, concentrated into one unit about the size of a




R. H. SMITH'S MOTOMETER AND THE WRAY PUMP

four-cylinder coil box. It is mounted on the dash and is driven from the camshaft of the engine by means of shaft and gears. There are no magnetic vibrators, commutators or moving wires and only one adjustment in the outfit. With that it is possible to adjust from a very long, hot spark to one extremely light. For this device the consumption of battery current is claimed to be small because there is only one spark and it is possible to adjust the spark down to exactly the amount necessary for an efficient explosion. Another feature is that the inability of the apparatus to make a spark on the reversal of rotation of the engine eliminates to a certain extent the danger of cranking with the spark advanced. A new idea is a low-reading ampere meter for testing the current consumed by a coil.

**Ehret Specialty Co.—Tool Receptacle**

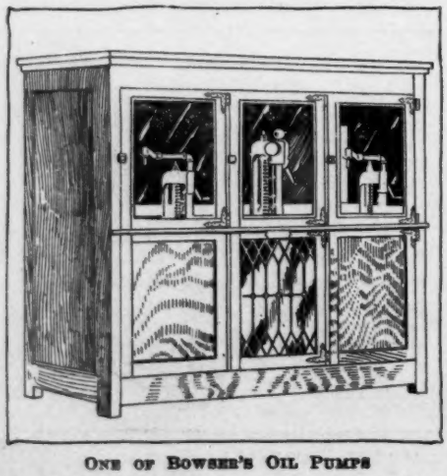
A place to keep spare tires and tools is provided in the device exhibited by the Michael Ehret Specialty Co. The inventor has used the space between the cushions and the back of the tonneau and put forth something unique. The receptacle is built into the rear of tonneaux of touring cars. It is reached by two doors that, when closed, conform to the lines of the tonneau. If it were not for the necessary hinges and locks it would be impossible to detect the hiding place. The device is shown in a touring car which occupies the stand of the company and the novelty of the idea makes a hit.

**Manufacturers' Foundry Co.—Castings**

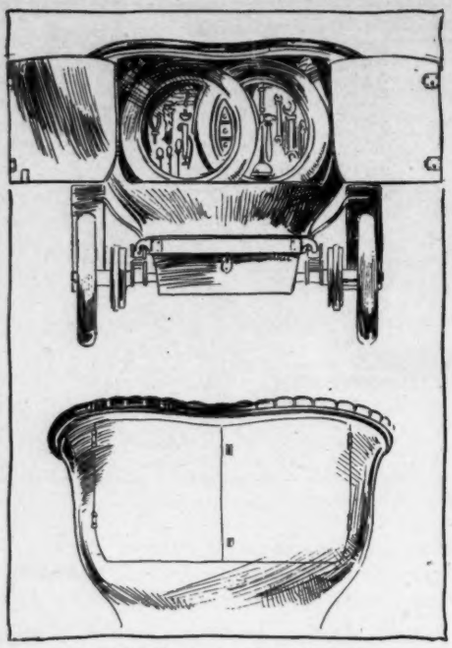
Being in the nature of a contracting firm which handles different patterns its customers send it, the Manufacturers' Foundry Co. contents itself with displaying samples of its work. The exhibit consists of both air-cooled and water-cooled cylinders, some entire and others sectioned, to show the intricate coring and quality of the metal. The company also shows finished and rough pistons, piston rings and cylinder heads.

**Winchester Speedometer Co.**

The old McGiehan Mfg. Co. is now the Winchester Speedodometer Co. and its booth in section F is well stocked with speed and distance indicators. The Winchester speedodometer, known as model C, combines in one instrument a speed indicator and an odometer which records the distance traveled for the trip and for the season. Those who do not desire to ascertain their speed will find in the Winchester odometer, known as model A, an instrument which faithfully records the combination trip and season mileage, while model B odometer pays no attention to single trips but records the total mileage for the season. The 1907 models have been altered some, showing several improvements in material, construction and operation.



One of Bowser's Oil Pumps



Ehret's Tonneau Tool Cabinet

**R. E. Dietz Co.—Lamps**

The Dainty side and tail lights and the Orient and Regal lamps in the flat back pattern are displayed by the R. E. Dietz Co., the manufacture of the Peerless and bullet-shaped oil side lights having been discontinued. To this line have been added the Sterling lamp, a square type adapted to use on limousines and landaulets, and the Royal lamps for use on heavy cars. Prominent on the stand are the barrel type of gas headlights and searchlights, as well as the Imperial, a parabolens light. Instead of the 1906 type of generators the company has its No. 5 and No. 6 Handy generators, holding 2 and 5 pounds of carbide respectively.

**Jones Speedometer—Speedometers**

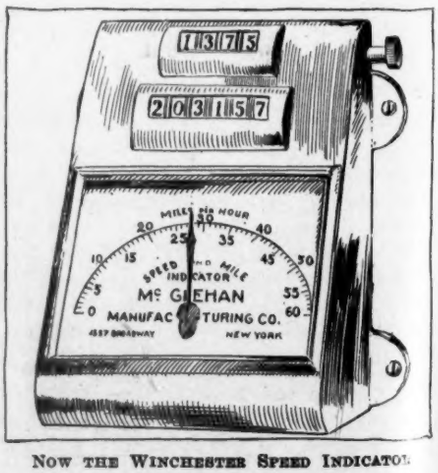
The 1907 Jones Speedometer practically is the same as put on the market in 1906. As is well known, the Jones is actuated by means of a flexible shaft and gear attachment on the wheel of the car. The driving gear consists of a large gear attached to the hub of the wheel, a small gear carried by a ball-bearing shaft at the end of the flexible shaft being supported on the steering knuckle by means of an attaching bracket. The small gear shaft support has a swivel base which permits the gears separating in case any obstacle comes between the teeth. The dial reads to 60 or 100 miles and is 4 inches in diameter. The company also has another odometer which reads to 50 miles, the only difference being that the dial is 3 instead of 4 inches. There also is a dashboard trip odometer which is actuated by a flexible shaft and gear drive the same as the speedometer. The total mileage also is given and the trip indicator is so fixed that it can be set back to zero by turning a stem on the lower side.

**Eastern Carbon Works.—Dry Cells**

Eastern gas engine dry cells are being featured this year by this exhibitor. The company began 18 months to 2 years ago to work on a special ampereage cell especially for the gas engine trade and has just now brought the cells to a state of perfection. The principal point claimed for them is their remarkable recuperative powers after having been run down. They are made in 2½ by 6, 3 by 7 and 3½ by 8 sizes. Besides the new cells, the Eastern Carbon Co. is showing its regular Eastern dry cell and its Eastern battery connector, of which an enormous number have been sold. Perfect contact at the terminals is assured with this connector by the use of soft rubber washers that are compressed when the thumbscrews of the post are screwed down, so that even should the nuts work loose the expansion of the rubber will hold the metal of the connector firmly to its seat on the post.

**Brownell-Trebert Co.—Motors**

Many changes have been made for 1907 in the B-T motors, and for the purpose of emphasizing these improvements the company is showing one of its 1906 four-cylinder engines and its latest 1907 design. The latter has the crankcase and transmission box cast in one piece, of aluminum alloy, with the flywheel enclosed. This secures perfect and permanent alignment of the sliding gearshafts with the crankshaft and clutch. The very latest feature of the engine is a special lubricating system. Cast in the base of the crankcase is a receiver for the oil that is allowed to flow through passages in the bottoms of the oil reservoirs into which the crankcase

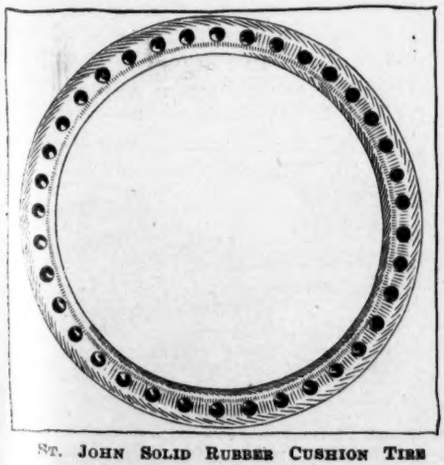



Now the Winchester Speed Indicator

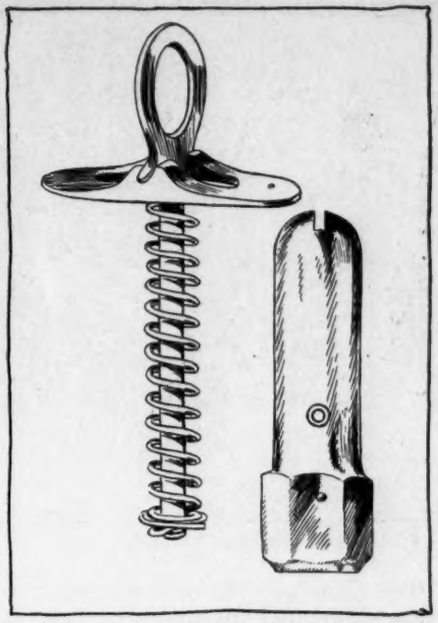
is divided by vertical partitions that also provide bearings for the shaft between each two throws of the cranks. From this receiver the oil is pumped back to the respective cylinders by a positive pump geared to be driven from the end of the mainshaft. Thus a continuous circulation of oil from the crank-chamber to the cylinders is maintained. Splash is depended upon to lubricate the crank and wristpin bearings. A much more important feature of the new engine, however, is the valve arrangement. Instead of rocker arms mounted on top of the cylinder heads as in the older model, the rocker arms are placed inside of the crankcase, where cams on the camshaft operate them to pull down on the valve rods. A special new hinged attachment connects the tops of the rods with the valve stems. This is quickly separated to release the valve for removal. Special care has been taken to cool all the valves and the exhaust passages. There are two sets of spark plugs set into the cylinders from the sides, so two systems of ignition can be employed and either a magneto or battery system switched in at will. The current distributer is disposed at the end of a vertical rod driven by bevel gears. The four-cylinder engine is of 20 horsepower, while a six-cylinder motor also on exhibition is of 35 horsepower. A third engine, of four cylinders and rated at 40-45 horsepower, also is shown. Another feature of the exhibit is a new double-chain drive transmission operating with sliding gears and having the differential inside of the gearbox. This is made in two styles, one for shaft drive, and is for heavy work, a number of the transmissions being now in use on heavy trucks of 45 horsepower which are daily seen on New York streets.

**St. John Rubber Tire Co.—Tires**

A White steamer which has traveled 18,000 miles on St. John solid rubber cushioned tires is shown by the St. John Rubber Tire Co. in connection with its tire display. This tire is constructed in one piece, the road tread or face of the tire which comes in contact with the road being solid and from ¾ to 1½ inches in thickness. The inside rim of the tire, which fits to the wheel, is also solid.



St. John Solid Rubber Cushion Tire



Kinwood Latch and Safety Tire Device

These two rims rest on rubber cushions formed by the openings around the tire, the opening between each cushion producing the resiliency. The tire fits standard clincher and single rims, it being fitted by being sprung into place and bolted. They are fastened to rims with ⅜-inch brass bolts. A half-round brass plate or nut rests in the opening between the cushions into which the bolts fit. The strain comes on these plates and not on the structure of the tire because of this.

**Hill Mfg. Co.—Tops, Bodies, Seats**

This is a Buffalo concern and exhibits samples of its wares in the shape of a complete body, with an extension top, and painted green and dark green and upholstered in full leather of the same color. There is also a cape extension top on a frame, apart from the body, and a new design in wind shields, the merit of which lies in the scheme provided to permit its being folded and put out of the way of the occupants of a car. Samples of cushions, leather used in top manufacture and seats help form the exhibit.

**Brown-Lipe Gear Co.—Transmissions**

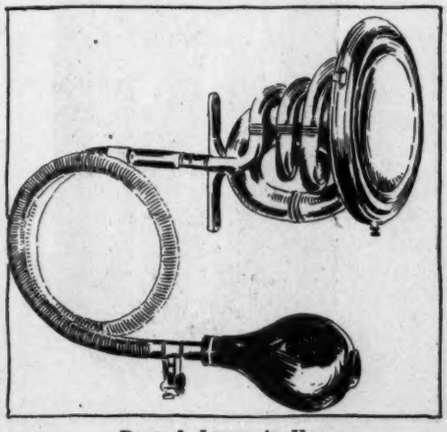
Three types of sliding gear transmissions in aluminum alloy boxes with shifting levers attached for demonstration purposes are an attractive feature of the Brown-Lipe line. Besides these there is shown a line of Brown-Lipe equalizing gears for sprocket and chain and for bevel gear drive, with both spur and bevel gear types of differentials. These are painted in black, with the sprockets, brake drums and the large bevel-driven gears nickeled and polished. Complete steering gears with columns and hand wheels are mounted on the counter as samples of the company's work. Of the transmission gears one is of the Thomas car type, with the secondary-shaft mounted directly over the primary-shaft. Another is of the Elmore type, with the shafts side by side and the primary shaft carrying two gears sliding independently, one to engage reverse and low-speed and the other to engage second and high-speed, with direct drive on high. A simpler but not so compact form has a progressive movement through all gears by a straight forward movement of the one lever. In this a single set or pair of gears formed in one piece on a collar slides on the primary shaft, engaging the reverse pinion at one extreme of the throw and, at the other, after passing successively through low and intermediate gears, engaging a jaw clutch formed on the face of the pinion on the shaft from the engine clutch. In all types the gears for the secondary shaft are riveted onto flanges on the shaft, and the shafts rotate on either annular ball-bearings or on roller-bearings.

**Allen & DeKliuchevsky—Engines**

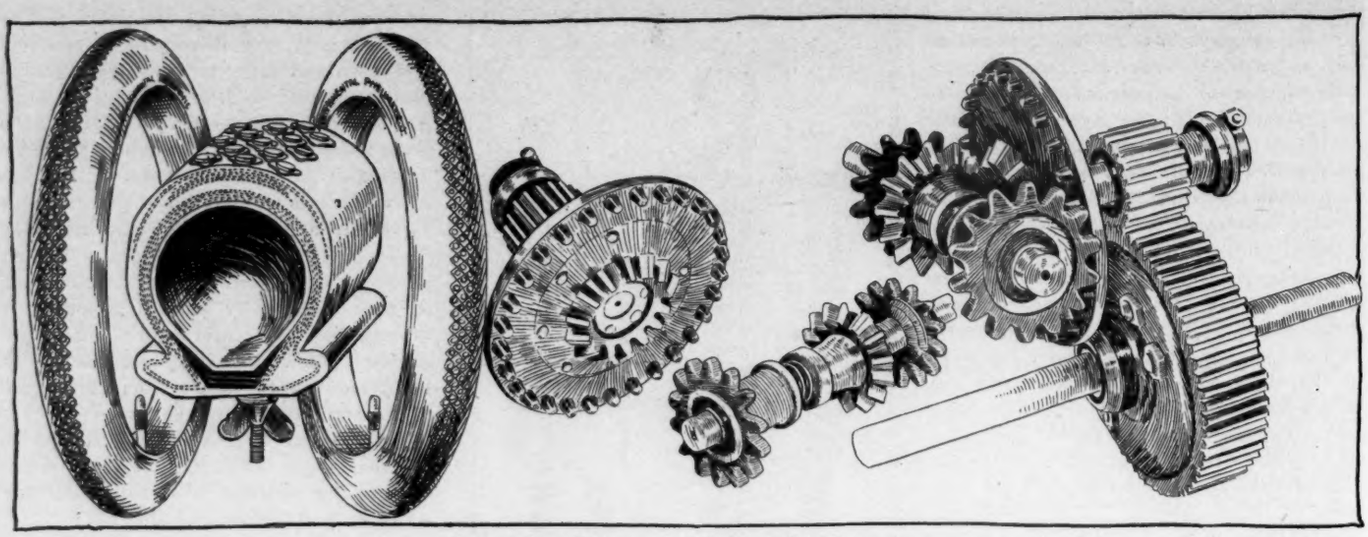
A four-cylinder engine is shown by this firm. It is of 80 horsepower and weighs only 400 pounds. The cylinders are cast separately and are fitted with copper waterjackets. The valves are all set in cages, around which the cooling water circulates. The exhausts are only about 8 inches long and are turned upward and toward the rear. Careful workmanship is evident on the engine, which is especially built for high speed work.

**George Loring & Co.—Spark plugs**

W. E. B. spark plugs with special porcelains formed with corrugated or double rounded heads to prevent short-circuiting, are shown. With this plug it is not necessary to take out the porcelain to clean it, as the head of the porcelain can be rubbed clean without trouble. The W. E. B. plugs, which are made by the Arc Spark Co., for which the George Loring Co. is selling agent, are made in all sizes with metric, standard and Autocar threads. One size made especially for large cars and motor trucks, is designated the Heavy Traffic plug. One of these that is on exhibition has been used for 9 weeks on a truck without cleaning. The Heavy Traffic plug has an insulation of special composition that is as heavy as stone and so hard it will scratch glass. The material does not contract or expand and it is claimed can be heated white hot and thrown into cold water without cracking. Attention



Post & Lester's Horn



CONTINENTAL TIRES AND HASSLER TRANSMISSION

is drawn to this stand by a 2-foot model of one of the plugs connected with an electric current and made to throw a 2-inch spark at frequent intervals.

**Direct Drive Axle Co.—Transmissions**

The Pleukharp transmission is shown for demonstration purposes assembled in a frame complete with wheels. In addition the exhibit embraces a transmission unit as marketed and the various parts, as the big bevel gears, the driving shaft and its two bevel pinions, etc. The change speed gearing and the differential are encased in one housing on the rear axle or countershaft. There are two forward speeds and one reverse, all operated by one lever. A double-acting positive clutch sliding on the driveshaft locks alternately to the shaft two pinions engaging respectively large and small bevel gears on the differential and providing high and low speeds, with direct drive on each. The gears are always in mesh so there is no danger of stripping a gear by improper shifting. It is not necessary to withdraw the engine clutch when shifting gears. Reverse is obtained by engagement of the low-speed and shifting a clutch that slides on the end of the live axle adjacent to the differential, locking one-half of the axle and releasing the other.

GOULD STORAGE BATTERY

**William Cramp and Sons' Co.—Bronze**

Parsons manganese bronze and Parsons white brass have entered into the construction of many of the best known American-made motor cars, and samples of this work are exhibited by the Philadelphia concern. Such parts as crankcases, levers, wheels, truss frames, engine supports, bearings, brackets, connecting rods and axles are included in the display. The company has brought out a hollow rear axle casing made of Parsons manganese bronze that has attracted attention from some of the motor car engineers on account of the simplicity in design and apparent strength shown. A type of commercial axle, such as used by the Commercial Truck Co., having wide-spreading jaws to fit the heavy steering knuckles, is one of the new things that is displayed. So far as the motor, transmission and similar parts entering into the construction of a motor car is concerned, there is little in which these metals are not used and samples thereof shown.

**Michelin Products Selling Co.—Tires**

Studded tread non-skid Michelin tires like those on which the last Vanderbilt cup race was won are shown as a special type by this American selling company for the Michelin products. In these tires the steel-studded leather tread band is countersunk its full thickness in the rubber and vulcanized firmly to the tires. It was this careful construction that prevented the bands pulling off in the gruelling race over the slippery roads last October. The regular Michelin smooth round tread touring tires and flat corrugated racing tires are shown, together with inner tubes. As a background for the whole display an elaborate cabinet stands against the wall at the rear of the booth filled with carefully arranged sections of all the different tires made by Michelin, valves, pumps, tire tools, patches, etc.

**Scandinavian Fur and Leather Co.—Motor Clothing**

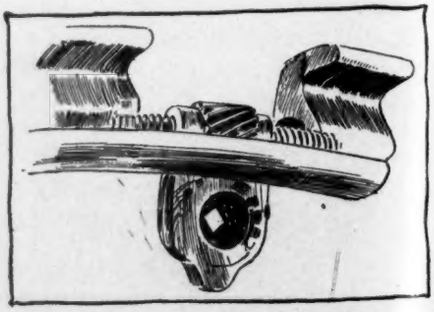
Anything and everything that a motorist can use in the way of wearing apparel is shown by the Scandinavian Fur and Leather Co., the stock shown consisting of all sorts of men's and women's fur coats, cloth coats, dust coats, fur-lined coats, leather coats, rubber coats, cravenette coats, foot warmers, gloves, gauntlets, goggles, hats and caps, boots, leggings, lap robes, steering aprons, sleeping bags—in fact, one could hardly imagine anything in this line that is not on display.

**Post & Lester Co.—Accessories**

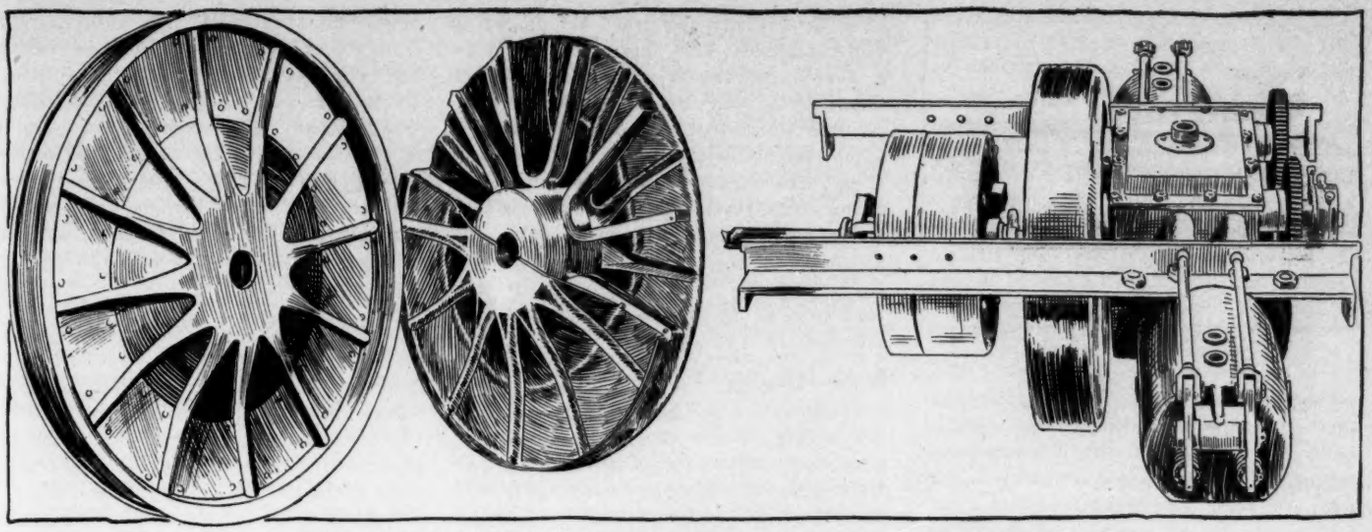
The Volier horn is the novelty of the line of the Post & Lester Co., but in addition to this the company has a full line of Luna and Imperial clocks, new models of the Royal De Luxe lamps and generators, imported French ignition specialties, Duray goggles, Watertire tire jackets, the Post & Lester line of clothing specialties and a full display of motor car goods.

**Turner & Fish Co.—Steel Wheels**

The steel wheel exhibit of the Turner & Fish Co. is featured by a large steel speed rack showing four wheels running at different speeds—5, 20, 40 and 60 miles an hour—for the purpose of demonstrating the general appearance of the wheels un-



NEW STYLE HARTFORD TURNBUCKLE

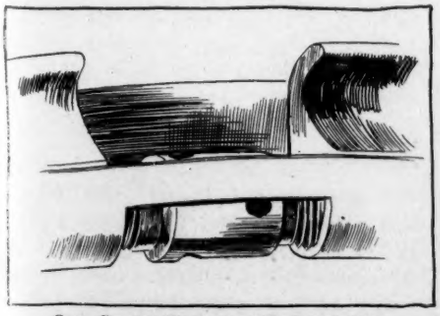


TURNER & FISH'S METAL WHEELS AND MODEL GAS ENGINE AND TRANSMISSION

der all conditions. In the booth are a dozen models of indestructible steel wheels for runabouts, touring cars and light and heavy commercial vehicles. Some of them are equipped with various makes of well known hubs, tires and rims. Advantages claimed for this type of wheel are that it has strength, durability and neatness; that it is absolutely true, not being affected by atmospheric changes; that it is easily cleaned; that it collects less mud and dust than spoked wheels and that it has less wind resistance, therefore making it faster with the same amount of driving power. The wheel is made of two sheets of high carbon, two-pass, cold rolled steel, each sheet being drawn and formed. When the disks have been formed the rivet holes are punched and the halves are then riveted together, practically making a solid background for the spokes. The steel plates are separated and placed so as to support the outer edges as well as the center.

**Light Mfg. and Foundry Co.—Metal Castings**

In section S is located the Light Mfg. and Foundry Co. with an exhibit of aluminum, manganese bronze and bearing metal castings. The manganese bronze is adapted to the manufacture of gear wheels, pinions, brackets, levers wheel hubs, cardan crosses, friction plates, piston rods and propeller wheels, the metal being guaranteed to exceed government specifications, which are 65,000 pounds strain to the square inch, 30,000 pounds elastic limit to the square inch, 15 per cent elongation in 2 inches and 25 per cent reduction of area. The use of manganese bronze is a departure for this concern, which heretofore has confined itself to aluminum so far as the motor trade was concerned.



OLD STYLE HARTFORD TURNBUCKLE

**Diamond Chain and Mfg. Co.—Chains**

Chains of all types are displayed by the Diamond Chain and Mfg. Co. The Diamond chrome nickel steel chain possesses very high tensile strength and is of extremely light weight, with from ½ to 1½ inches pitch. The chain also has beveled sides and reamed holes. In addition to this type the company also displays the Diamond built-up block chain, which is rollerless and fits roller chain sprockets. Great strength is claimed for it and it has a large rivet-wearing surface.

**B. F. Goodrich Co.—Tires**

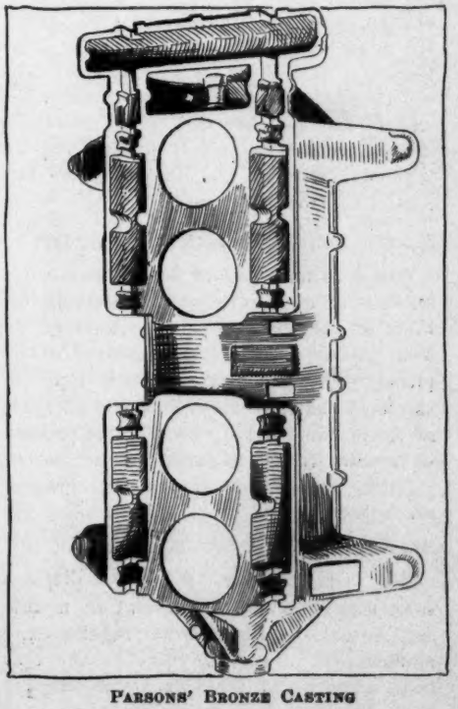
Last season the B. F. Goodrich Co. put on the market the Goodrich quick detachable tire and rim and the service they got in actual road work has won the combination a place at the show. In addition to this there is the regular clincher type of tires in smooth tread, Bailey tread and flat tread. Makers and users of commercial vehicles also find at the Goodrich stand something of interest in the display of Goodrich solid rubber side wire tires of all sizes from 2 to 7 inches.

**Hess-Bright Mfg. Co.—Ball-Bearings**

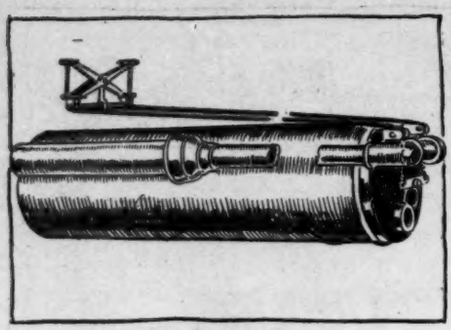
The main feature of the exhibit of this company is a large frame extending all the way across the front of the booth and having arranged on it in neat series the annular two-point ball-bearings known as the Hess-Bright in this country and in Europe under the initials D. W. F. In the center is a bearing of the largest size, measuring a foot in diameter with balls 1½ inches through. Radiating from that to the ends of the frame are bearings graduated in size from 1¼ inches to more than ½ foot across the center from the periphery of the outer ring cup to the opposite circumference. In all of these sizes the balls are spaced apart evenly to prevent the clicking from dropping against one another as the bearings rotate. Coil springs packed with felt soaked in grease to provide constant lubrication are used for spacers. A new feature is the enclosing of the coil spring in a steel sleeve split on one side. These spacers fit in the ball grooves between the two inner and outer rings that comprise the cup and cone. The rings, by the way, are all made in Germany of special hard metal and are imported. The bearings are non-adjustable, as there is practically no wear.

**Franco-American Automobile Supply Co.—Accessories**

The Look Electric Co.'s storage sparking batteries are shown by the New York selling agency. The samples are of 6-volt and 60-ampere hour capacity. At the front of the stand is a panel to which are attached the various parts such as grids, grids filled with positive material sepa-



PARSONS' BRONZE CASTING



GRAY-HAWLEY CUT-OUT

rators, connectors and vents. At the rear of the stand is a rotating device made of bent glass tubes filled with mercury paper through which is passed an electric current producing a pretty color effect.

**Neumastic Tire Co.—Rubber Filler**

The exhibit of this company was not installed until Tuesday morning. It consisted of samples of the plastic rubber composition filler that is forced in a heated state into the pneumatic tire under air pressure and of sections of tires so treated under the filling process the air comingles with the fluid composition and forms air bubbles so that upon cooling it makes a spongy mass that gives resilience to the tire regardless of any number of punctures. It is especially suited to use in old tires that are not readily repaired. The Long & Mann Co. demonstration of the Minute tire detaching and replacing tool is being made at the booth of this exhibitoor in the visitors' gallery. This is a simple and easily manifested tool having an extensible handle with a rubber-covered loop at one end to be placed over the wheel hub. At the middle is pivoted a device of special form with a set of steel rollers to be inserted between the tire bead and rim edge. The device also has a flange to engage with the edge of the rim. When the edge of the tire has been pried loose by means of a phyer on the tool the rollers are inserted and with the loop around the wheel hub the other end of the handle is drawn around the wheel pulling the attachment with it and throwing the tire edge free from the rim.

**Electric Storage Battery Co.—Batteries**

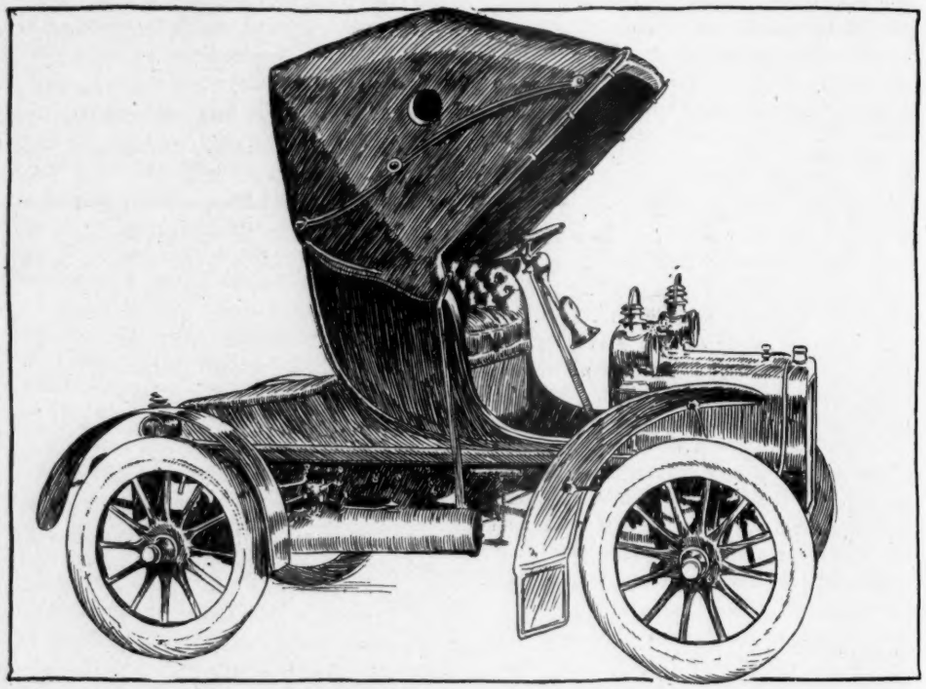
One does not have to be the user of an electric to appreciate the interesting exhibit of the Electric Storage Battery Co. The quaker concern has a number of its pleasure and commercial vehicle types of the Exide battery, as well as several types of the Exide sparking cells. This product is familiar to the motoring public and no startling innovations in the 1907 product are noted.

**Gray-Hawley Mfg. Co.—Autochime**

The Gray-Hawley Mfg. Co. displays something new in a combination muffler and Autochime, which is the regular Gray muffler with a special valve in the rear head made up of three openings—one for the regular exhaust outlet, one to be used as a cut-out and the other for operating the Autochime. This valve is operated by a double foot pedal placed in the floor board of the car. By means of it the exhaust is emitted directly from the first or inner chamber of the muffler into the Autochime. The regular model of the Autochime is composed of only one tube, which is divided into compartments, giving the different tones. A cup-shaped bell extends over the base, preventing oil and mud from being thrown up from the road into the sound openings of the device.

**Rands Mfg. Co.—Tops**

Formerly the Wheeler Mfg. Co., the Rands Mfg. Co. has on view its latest pattern of extension top, features of which are wood bows fitted into seamless steel sockets either covered with patent leather or enameled in black. Waterproof fabric is used as material and hair padding and extra strong stringers embellish it. Incorporated in the construction of the top are Brewster fasteners, extra heavy celluloid and second growth straps made of a special leather.



ONE OF TOPS SHOWN BY DETROIT MOTOR CAR SUPPLY CO.

**Detroit Motor Car Supply Co.—Tops**

New ideas in 1907 tops, bodies and wind shields make up the exhibit of the Detroit Motor Car Supply Co. There is one finished limousine body painted in wine color with blue leather upholstery which catches the eye, while near it is a Victoria top in hand-buffed leather with wine broadcloth linings. A third 1907 creation is a cape extension top shown by the company.

**Uncas Specialty Co.—Gasoline Separator**

With the idea of eliminating all foreign matter from gasoline the Uncas Specialty Co. has produced the Leavitt gasoline separator, which contains a fine gauze net which stops the foreign matter and thoroughly filters the fuel. The water and dirt collect in a well and then can be drained off by means of a pet cock. It is shown in ⅛-inch and ¼-inch pipe size inlets. The company also shows other lines of specialties carried by it, but the separator appeals to those who have trouble on the road which has been blamed on the ignition system only to find, upon investigation, that it was water and dirt in the gasoline.

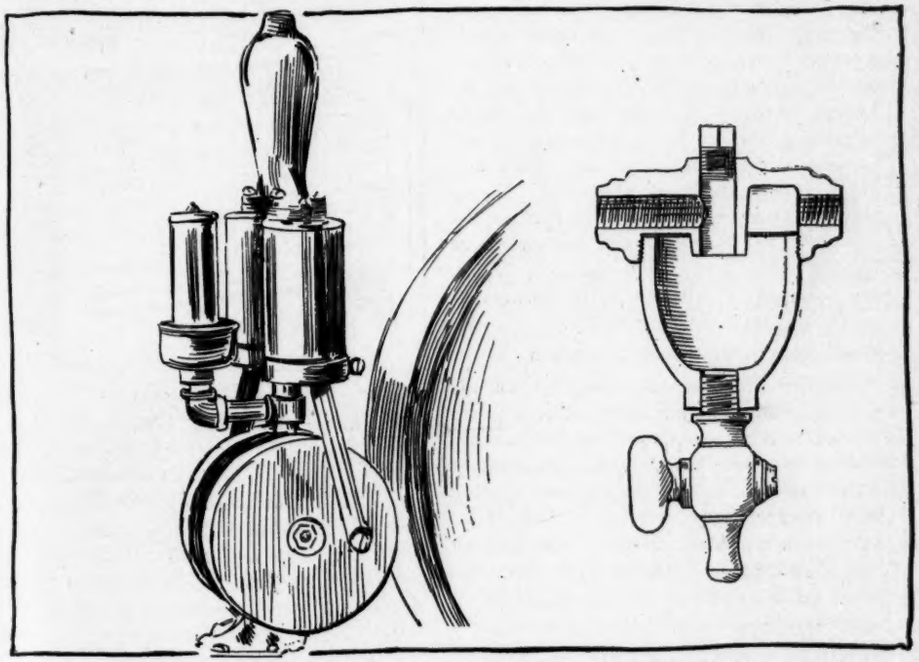
**A. W. Harris Oil Co.—Oils**

Although no new oils or greases are shown this year by the Harris company, its exhibit is made interesting by means of a special display stand on the shelves of which cans of gas engine oils, cylinder oils, motor grease, graphite grease for chains and gears and liquid metal polish are shown. For the purpose of demonstrating visibly the various qualities of the lubricants, such as fluidity, tenacity, viscosity, etc., there are a series of five short vertical glass tubes filled with glycerine into the lower ends of which different oils are fed by rubber tubes from cans on an upper shelf and allowed to float drop by drop to the top. Below these is an inclined tin with grooves pressed in its surface. Other oils are fed into these grooves and permitted to flow down and drop off. Incandescent electric light bulbs behind the glass tubes reveal the operation effectively at night to the crowds of spectators.

**Gray & Davis—Lamps**

A generator of entirely new form is the greatest novelty of the Gray & Davis extensive line of gas and oil lamps, which is represented in all its variety by upwards of 100 glittering polished brass samples. The new generator is in the

form of two cylinders, one above the other, and both attached horizontally to a metal frame intended to be screwed to the dash or side of the car. The upper barrel is the water reservoir, while the one below contains the carbide holder. This holder can be removed for cleaning and filling by unscrewing a central tubular feed pipe having a number of small perforations along its length to permit escape of the water into the calcium carbide. The generated gas passes by a tube up into and through the water chamber, where it is cooled, thence down through the water again into a drying reservoir at one end of the carbide holder. Flow of the water is controlled solely by the gas pressure. A single valve shuts off the water and gas at the same time. The Gray & Davis square oil lamps are of a new shape this season and all are made of heavier metal. In the gas lamps the lens mirror is used altogether. A new square tail lamp has also been added to the line and those who visit the stand like the looks of it.



GRAY-HAWLEY BOAT CHIME AND LEAVITT GASOLINE SEPARATOR

**Aurora Automatic Machinery Co.—Motors**

One Thor motor cycle following the well known Thor lines with the engines occupying the place of the seatmast and driving by side chain is shown by this manufacturer, for whom Brandenburg & Co. are sales agents. One of the Thor air-cooled bicycle engines is displayed on a metal stand at a convenient height for inspection by show visitors at this stand.

**Vestal Shock Absorber Co.**

Complete Vestal shock absorbers and the various parts that enter into their construction are displayed by this company. The latest improvement in this device is the employment of helical compression springs to cushion the action of the vertical arm that connects the spring block on the car axle with the free end of the shock absorbing device. These springs take the first shock, which is then communicated gradually to the friction rings contained in the circular housing bolted to the side frame member of the car. This absorber counteracts the spring movement in both directions.

**Badger Brass Mfg. Co.—Lamps**

In the extensive and well known line of Solar gas and oil lamps and acetylene gas generators there is no radical change in principle or form, although a new size of square oil lamp has been brought out. The newest style searchlight has flaring front, slit glass front and lens mirror. The company is now at work bringing out a small swivel searchlight especially for use on trucks and designed to be used with a single generator. The most expensive and imposing lamps in the line are the searchlights with three and four element lenses supported between the plane front glass and the flame in metal spiders. The lenses are each made of several pieces, carefully ground and polished and cemented together with the especial object of projecting a strong beam of light far ahead and at the same time shedding more divergent rays on the road close in front of the car. The newest features of the line are a special cam fastening used on the generators which are weighted and adjustable to facilitate clamping and to regulate the clamping pressure. There is one of these cam fastenings on either side of the generator, and by means of them the carbide chamber can be instantly attached or detached to or from the water reservoir. There is also a new fastening on all of the oil lamps. Two semi-circular springs are riveted to the inner side of the collar of the oil reservoir, and push buttons riveted to the free ends of these springs extend out through openings in the collar on opposite sides so that they can be easily depressed with the fingers. On their inner sides the springs have soldered to them wedge-shaped pieces of metal that allow similarly wedge-shaped lugs on the lamp body to pass them when the two parts of the lamp are pressed together and then engage underneath the wedges by the spring action and prevent the release of the parts until the buttons controlling them are pressed.

**Motz Clincher Tire Co.—Tires**

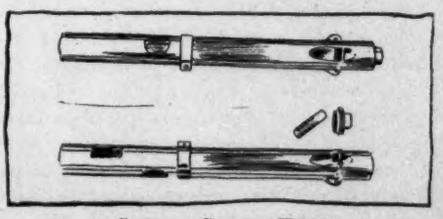
Particular attention is being called by this exhibitor to what is called its new cushion tire. This has a broad, deep groove in the center of an otherwise flat tread and is molded with undercut sides supported by trusses of rubber molded with the tire. Under weight, the tread tends to spread out and the sides of the tire to crowd up against the edges of the rim but they are cushioned against this by the trusses. By this form of construction the makers secure greater resiliency, increased traction and better support on sandy roads, while there is decreased liability of skidding on wet streets or muddy roads. The Motz tire, which is also shown in the older style with corrugated convex tread, is retained in the rim.

**Duplex Ignition Co.—Spark Plugs**

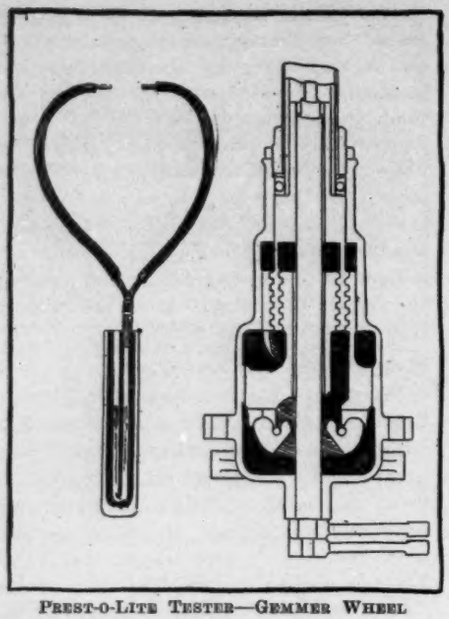
The line of Duplex spark plugs exhibited in the visitors' gallery by this company has for its most important feature a condenser by which the annoyance due to sooting of the plug can be avoided. When the firing begins to grow too weak a little plug switch in the outer insulated end of the plug can be pulled and the current sent through the condenser circuit, which intensifies it and produces a stronger and hotter spark.

**Goodman & Graham—Shock Absorbers**

The Graygood shock absorber is being demonstrated at the stand of this firm. A light carriage spring is mounted on a table and a lever is so arranged that the spring can be compressed with it and suddenly released. Bolts are provided to engage the two ends of the absorber, which can be quickly put on and taken off. Thus the difference in the action of the spring with and without the shock absorber attached is brought forcibly to the attention of the lookeron. The Graygood absorber has a cylinder filled full of glycerine and a plunger with a piston sliding in the cylinder. At the center of the piston is a small passage that allows the



GABRIEL SINGLE HORN



PREST-O-LITE TESTER—GEMMER WHEEL

glycerine to pass slowly from one side to the other. The size of this opening is adjustable to the tension of the spring. Action of the spring in either direction is checked down to the rate of flow of the fluid through the piston.

**Gemmer Engine Co.—Engines**

A four-cylinder Gemmer engine, similar to those used in the Wayne and Dolson cars, constitutes the exhibit of this company, for which Brandenburg & Co. are selling agents. The four cylinders are cast in pairs with integral jackets and have the inlet and exhaust valves all on the same side. The inlets are above the exhausts and the pipe leading to them passes over the top of the cylinders. The camshaft is enclosed in the crankcase, where the splash of the oil will keep it thoroughly lubricated. Four-legged spiders hold down the push rod guides onto the crankcase, in which there are ample hand holes on either side. A vertical timer shaft is driven by bevel gears from the rear end of the camshaft, while the circulating pump is driven by means of a spur gear at the other end of the camshaft.

**Autmo Cabinet Co.—Tool Cabinets**

"A whole machine shop on wheels" is the way the Autmo Cabinet Co. describes the Autmo tool cabinet which is shown in a gallery stand. Two years were spent bringing out this labor-saving device and the result of this work is a cabinet containing all manner of tools for general repair work on motor cars which can easily be removed to any part of the garage. Being adjustable it can be raised up from the floor by pulling a lever on the end of the cabinet, while reversing the same lever will make it stationary. The cabinet consists of twelve drawers and two cupboards. The six upper drawers are 12 by 14 inches and the lower ones 8 by 14 inches, all of them having a side extension which permits them being drawn out full length without falling off the support. The tops and frame are made of hard maple and the exterior of chestnut. It is finished and oiled. The cabinet rests on a small truck so it can be moved about readily. The contents of the chest include a 1-6-horsepower electric motor, controller with lamp socket attached, Edison tap, 3-inch chuck, emery wheel, Autmo vise, Autmo anvil and surface plate, a set of drills and files, saws, wrenches—in fact, everything imaginable that is needed for general repair work. Every drawer has an interlocking device, the lever which operates the lock being inside of the left door.

**J. H. Sager Co.—Equalizing Springs**

The Sager equalizing springs are nothing new—they are the same thing the Sager company put on the market 2 years ago, the device acting automatically both on compression and recoil of the springs, preventing bumping and tossing. The Sager people have something new, though, in a shock eliminator, designed as a remedy for stiff flat springs. It is known as the Sager flexible, the coils being elastic and less resisting than flat springs, taking up the vibration. The Flexible is not intended to take the place of the Sager equalizing springs but can be used in connection with them or in fact with any other shock absorber, obviating the removal of leaves when the flat springs are too stiff. The company also has an unique idea in a tire grip or non-skidding device, the features of which are its fewness of parts, strength and durability.

**Webb Mfg. Co.—Speed Indicators**

Speed indicators operating by an air current produced by a very accurate pump driven by the road wheel of the car are shown in operation. The instrument screws to the dash of the car and a small float rises and falls in a vertical glass tube with a scale marked on the dial on either side of the tube as in a thermometer. The height to which the float is raised by the current of air varies with the speed of the car. Beneath the speed indicator and forming part of the instrument are trip and total mileage dials.

**Motor Car Specialty Co.—Speedimeters**

The Lea speedimister is shown in several styles by this company, which acts in the capacity of selling agent for the manufacturer, William S. Jones. The instrument is in the form of a cylinder 3¼ inches in diameter, with dial face covered with glass and an adjustable bracket for attachment to the dash. A flexible shaft connects the instrument with a small spur wheel to be attached to the steering knuckle and engage with a spur gear ring on the road wheel. The long indicator hand moves along the semicircular scale under the influence of centrifugal force acting on a balance governor. This gives a steady motion, so the needle does not vibrate and make reading difficult. Combined with the indicator is a trip and total mileage register. The same company is also showing the Boss gasoline filter to be inserted in the fuel pipe leading to the carbureter. In the filter is a little cone of the finest brass wire mesh through with the liquid flows. At the bottom of the filter is a cap that can be unscrewed to let out the accumulations of dirt.

**Prest-O-Lite Co.—Gas Tanks**

The motoring public is familiar with the Prest-O-Lite gas tank, as well as the Prest-O-Lite device for filling tires, but at the show the company has its Prest-O-Lite line tester, which was produced because of complaints that gas tanks did not give the lighting service expected. The tester is designed to find any leak between the tank and the burner. To use it the glass tube, which is part of the device, is filled

AUTMO TOOL CABINET

with water about half way, then the two bits of rubber tubing coming from a common tube which is inserted in the water are attached to the lamp hose and the gas on the other lamps turned off. Then the gas is turned on at the tank until the water ascends to nearly the top of the tube. If there is no leak the water will remain level, but if there is one the level will change.

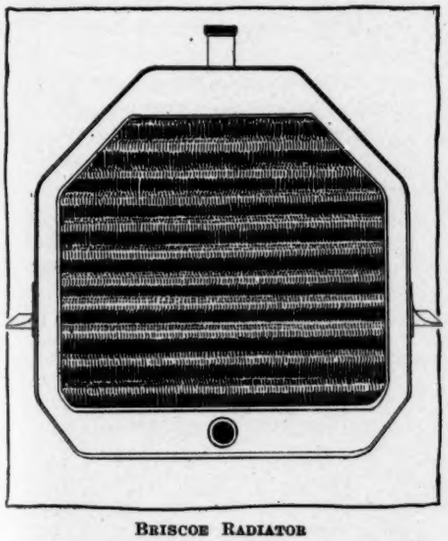
**Dayton Electrical Mfg. Co.—Ignition**

Apple igniting and lighting apparatus and storage batteries are displayed in a unique manner, the Dayton Electrical Mfg. Co. having put on its stand a solid oak cabinet about 4 feet high, with a representation of the dash of a motor car on the back of the top of the cabinet. On this dash there are an induction coil, a 12-S switchboard and a timer, while suspended on the dash are four spark plugs spitting fire continuously. An electric motor is installed inside the cabinet, the flywheel projecting through the top. This flywheel is intended to represent the flywheel of a motor under the footboard of a car and the Apple dynamo, equipped with an adjustable automatic friction governor and ball bearing flexible shaft, is driven by this flywheel. There is a storage battery located on the side of the case, the system working as follows: The dynamo charges the battery in proportion to the

battery's discharge and the current, which is distributed through the timer to the coils and plugs, is taken from the battery at all times, while the dynamo is used solely to charge the battery. The spark plugs show just how sparking is carried on inside the cylinders of a four-cylinder gas engine in action.

**Kilgore Automobile Air Cushion Co.—Shock Eliminators**

The display of Kilgore air cushion devices, or shock eliminators, was delayed in transit so it could not be installed until after the show opened again to the public on Monday. A couple of samples were on hand, however, and served to show the improvements made for 1907. These consist in providing sockets at either end to receive the ball portion of universal joints so that play of the axle in any direction will not damage the connections and in providing in the piston a series of holes with a rotating cut-off plate above them. The degree of opening of these air passages in the piston can be regulated from the outside by turning the threaded cap at one end of the telescoping cylinders so the movement of the piston can be made as easily as desired to suit different springs, or it can be made to work against the full amount of air confined in one-half of the interior. Before



BRISCOE RADIATOR

the company came to the show it thoroughly tried out the 1907 device on the road and it came up to expectations.

**Hartford Automobile Parts Co.—Drive Shaft Joints**

Drive shaft joints enclosed in neat pressed steel cups that slide on one another to allow for movement of the shafts without permitting dust or mud to enter are shown in a few samples by this company, which is new in the field and is only just getting ready to place its goods in the market. A distinct novelty that it is bringing out in its line of small parts is a special wrench that operates either way in difficult corners. This has a steel handle socketed at the end and holding loosely a socket piece adapted to take a hexagonal nut and having a castellated conical head. Set into the end of the steel handle on the under side just above the conical head is a projecting key or wing that can be engaged with the grooves in the head of the socket. A slight upward movement of the free end of the handle suffices to disengage the key from the socket head, when the handle is free to be moved independently. When the handle is depressed the handle and socket interlock by means of the key and groove so the nut can be turned in either direction. Of course, the tool is reversible, as a ratchet screw driver can be reversed without trouble.

**Aster Co.—Tires**

L'Electric clincher tires in various diameters and in round and flat treads are the prominent feature of the display of the American branch of this big French establishment. A new feature of the line that is so recently perfected that only one sample was finished just in time for the opening of the show is a non-skid tread made under the patent of Dr. Adams. This tread is formed by forcing several rows of steel nails set as closely together as their large flat heads will permit through three plies of heavy canvas and placing as many more plies of canvas over the heads, then setting this strip onto a flat or round tread tire and drawing down over all a strip of ⅛-inch pure rubber so the nails protrude. After vulcanizing, the rough ends of the nails are ground down flush with the tread, which feels smooth to the hand but under the weight of a car lets the steel studs grip the road surface. These treads are easily applied at small expense to tires that need recovering. Primary and secondary ignition current cable is shown in the large coils as it comes from the factory in France. The insulation is of rubber composition only, of two kinds, the inner one white and the outer one black and weather-resisting.

**American Electrical Novelty Co.—Parts**

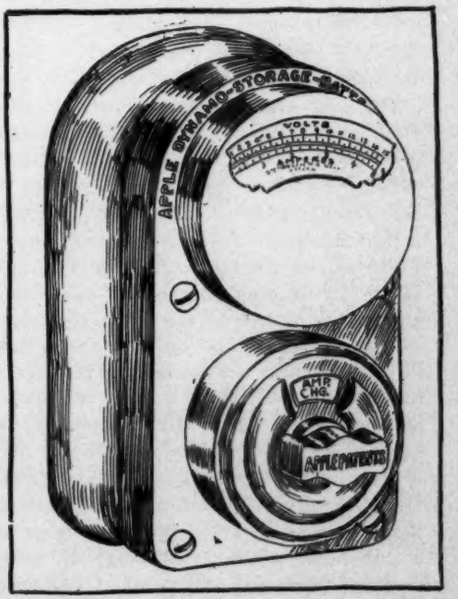
Some interesting new things are shown in the Ever Ready line of accessories carried by this concern. Prominent among these is the Ever Ready Autometer speed indicator and mileage register recently brought out by the Auto Improvement Co., a subsidiary company organized by those interested in the Novelty company for the production of the instrument. The speed indicator works by centrifugal force acting on a ball governor that pulls a pointer around the semi-circular dial at the upper margin of the face. This indicator dial measures about 6 inches in length and the figures are large enough to be easily read from the driver's seat. The governor and the odometer gears are actuated by means of a flexible shaft geared by fiber spur gear to a brass spur gear attached to the road wheel. The instrument itself is carried in an adjustable bracket to be screwed to the dash. One form of the instrument is combined with a clock enclosed within it. This style is called the Ever Ready Universal indicator and odometer. Besides the foregoing the American Electrical Novelty Co. shows the automatic engine starter that it brought out at last year's show, also manufactured by the Auto Improvement Co. and operating by means of a contained spiral spring and ratchets, the spring being wound by a crank. The device attaches to the end of the engine shaft in place of the regular starting crank. An electric dashboard gauge light, a dash clock with small incandescent lamp mounted above it to throw light on the face of the clock at night when a contact button is pushed, and an electric cigar lighter designed for attachment to the dash, attract much attention. The gauge light and clock are protected against rain by small adjustable hoods of waterproof cloth resembling a miniature buggy top. Ever Ready dry battery cells and portable electric flash lamps and pocket amperemeters are also shown.

**Muncie Parts Co.—Transmissions**

This exhibit was delayed but was installed Monday. It includes two selective type three-speed and reverse transmissions set in frames and complete with cardan shaft with joint and male member of a flywheel cone clutch. Besides these there are levers for operating two forms of transmissions, shaft joints and worm and nut steering gears shown at the stand.

**Ajax-Grieb Rubber Co.—Tires**

Ajax clincher tires and inner tubes in sizes up to 4½ inches are shown by this company, which has been marketing these goods during the past year. Its tires are made in smooth and wrapped tread styles. As a feature of the exhibit, a demonstration of tire making is given daily and every night in the stand, where a workman from the factory shows the various processes of building up a shoe on the heavy adjustable iron mandrel mounted




APPLE IGNITION OUTFIT

at the front of the stand. Although a newcomer in the tire field, the company is able to show with pardonable pride an Ajax tire of medium size that has been run 9,000 miles and yet is worn down only through the rubber tread and the floating strip of fabric made in the tire for use in stripping off the old tread. The wear is remarkably even all the way around the tire, and none of the rubber has been torn or stripped away.

**Thomas Prosser & Son—Forgings**

Samples of Krupp heavy automobile forgings of various sorts are exhibited, most of them bent and twisted to show the great tensile strength and toughness of the special steels made and employed by the great Krupp works in Germany. Among the samples, all of which are shown in the rough, are extra heavy crankshafts and I-section axles, the largest axle forged for use on a big truck being bent into U shape without sign of a rupture. Other axles are bent double without breaking all the way through, while sections of pressed steel frames are folded up flat on themselves, and steel rods 1½ inches thick are twisted nearly 100 turns in a length of a yard without developing a break or crack. Spring leaves are also shown, together with cast flywheel with fan blades.

**Mills Mfg. Co.—Goggles**

A line of the latest goggles is shown by this new exhibitor at the shows. The latest style is the Gogglette, which is made by this company for E. B. Meyrowitz, the New York optician. The feature of this goggle is the small pneumatic cushion that extends around the edge of each glass frame, providing dustproof contact with the face of the wearer without cutting sharply into the cuticle. The Gogglette has oval-shaped glasses, giving a wide range of vision on either side and made of crystal glass, curved to conform to the contour of the face. A cheaper and very popular form of goggle shown is the four-side or side light folding goggle, with imitation pigskin face mask to protect the nose and cheeks.

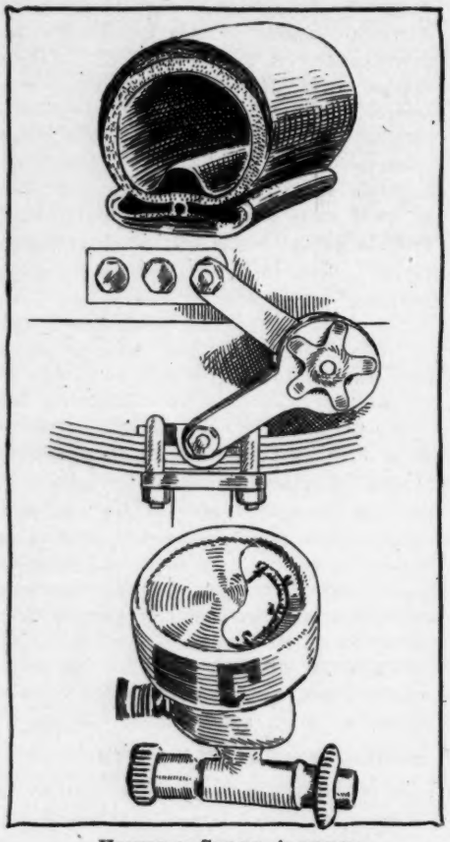
**E. J. Willis Co.—Sundries**

The new article featured by this New York selling agent and dealer in various sundries is the W. & N. valve lifter, a device resembling a carpenter's clamp. It has metal cross arms adjustably pivoted to a rod about a foot in length, one of which carries a screw rod having a winged head. By placing the end of this screw rod on the center of the valve mushroom and fixing one end of the lower cross arm underneath the valve spring the screw rod can be turned down until the spring is compressed sufficiently to permit the easy removal or replacement of the key in the valve stem. The Hopkins Auto Log for registering mileage and indicating the speed attained by a car is given a prominent position. Among the many sundries displayed are Schebler carburetors, Kal-Krystal non-freezing solution for engine cooling, Gray & Davis lamps, copper funnels in various shapes, tire repair kits, current distributors, tires and spark plugs. The non-freezing solution remains liquid in a temperature as low as 30 degrees below zero.

**Manhattan Screw & Stamping Co.—Lamps**

Although this is the first appearance of this concern at a motor exhibition, its goods are already well known under various names, as the company has for the last 5 years been making gas and oil lamps for the motor trade. Finally it decided to come out and market its own line under the name Phoebus. Its display, which is a large one, includes besides the Phoebus lamps and generators, Apollo three-tube exhaust horns, Atlas

SWINEHART PNEUMATIC TIRE



HARTFORD SHOCK ABSORBER
WRAY SPEED INDICATOR

tire holders and extensions for carrying extra tires on the car, horn screens, tail lamp brackets, pumps and oil guns, terminals, etc. Especial attention is called to a tail lamp of unique construction—the Tattle Tail lamp. The combustion chamber, with glasses roughly diamond shape, has the window for the white light set on one side at a sharp angle to throw the light onto the number plate. On the opposite side there is a small mirror set at an angle of 45 degrees to reflect the flame forward along the side of the car above the running board until the rays strike a second small mirror attached to the side of the dash, so adjusted that the driver can readily look into it and see whether or not the tail light is still burning. By this means he will be reassured against possible arrest or stoppage by the police and against collision from behind. The Phoebus model A head light has a lens mirror reflector. Attached to the front glass door is a spider carrying a strong lens at the end of a conical barrel that reaches well back toward the flame. This tube shuts out all interfering rays and asists the lens to project a powerful beam of light concentrated straight ahead, while the outer portion of the lens mirror spreads the rays outside of this tube and lens so they fall on the road directly in front of the machine. The generator for the gas lamps has a carbide basket with large mesh sieve that allows the ashes to shake down free from the unused carbide and permits free access of the water to the latter. Above the carbide holder fits a perforated disk that prevents the lumps from jolting up against the base of the water reservoir. Hinged bolts with wing nuts engage slots in the rim of the water compartment and clamp the two parts together gas tight, providing an almost instantaneous lock for the device.

**Igniter Appliance Co.—Spark Plugs**

The Shur Fire spark plug is the sole exhibit of this company. The novel feature is the baffle plate internal construction on the sparking end of the plug that is claimed to render it proof against the deposit of soot and oil sufficient to interfere with sparking. The end of the core, back of the sparking point, is formed by three collars that alternate with rings inserted in the threaded end of the shell. There is no contact, but the result is a tortuous passage reaching far back onto the mica insulation. The idea is that the crooked passage interferes with the passage of gases during ignition so that the soot and oil cannot be blown back where it will cause a short circuit.

**Autocoil Co.—Ignition Devices**

The "luxurious '07 Autocoil" is the title given the latest production in the ignition line brought out by this concern. This new coil has, in addition to the many convenient features of the company's earlier coils, the advantage of a combination with an ampere meter permanently attached to the front of the box and always in circuit. By its use the driver of the car can read the amperage at any time. As it is graduated in tenths from 0 to 1 ampere, the tremblers can be adjusted on the different units so the whole group is adjusted alike, decreasing the current consumption and causing the battery to give its best service. It is claimed that with the use of an ammeter coil a set of dry batteries can be made to last for an entire season on a four-cylinder car. Any deficiency in the wiring or the spark plugs will be quickly revealed by the ammeter. In the 1907 coil the units are slightly larger but they give the proper spark when the coil is

drawing only 3-10 ampere with the battery connected directly to the cell, and 2-10 ampere while running a four-cylinder car. Besides the ammeter coil, the company is showing its coil units, distributor coils, dual ignition coil for use on cars equipped with the high tension magneto system, with three-way switch attached to the front of the box, motor cycle coils and non-vibrator coils.

**Witherbee Ignitor Co.—Storage Batteries**

The Witherbee storage battery for ignition purposes is being shown in all its sizes by the makers. The Witherbee storage battery recharging outfit also is shown. The jar and carrying case of the battery is moulded with cells in one strong piece of vulcanite, the cells being already connected electrically, doing away with the need of connecting each separate cell, leaving only two connections to make when placing the battery in the car. The jar is claimed to be proof against leakage and is also weatherproof. A patented ventilator attached to the top of each cell permits the escape of gas while preventing slopping of the acid solution. These batteries are furnished in sizes from 10 to 35 pounds and in capacities from 6 volts and 40 ampere hours to 6 volts and 80 ampere hours and 8 volts and 6 ampere hours. The recharging outfits for direct current of 108 to 125 volts include a voltmeter, hydrometer and hydrometer jar and a syringe.

**Detroit Lubricator Co.—Oilers**

The Hodges force feed oiler is shown in two models mounted on a dash to show the operation. Oil contained in the reservoir is forced through the different leads to the cylinders and bearings by means of a multiple plunger pump, cylinders of which are mounted vertically on a cylindrical valve shaft casing in which a valve shaft is rotated. A sight feed device is mounted on the cover of the oil reservoir. Cams of the rotating shaft alternately lift and force down the plunger crosshead, causing the plungers to be drawn in and then by the movement of the valve shaft force out through the feeds an amount of oil that is predetermined by adjustment means. The Hodges oilers are handsomely mounted in mahogany cases and are made in various sizes, with from one to ten feeds.

**American Metal Wheel Co.—Juveniles**

Among the full grown touring cars the little electric runabout for children shown by this new exhibitor forms a striking contrast. It is a complete vehicle, equipped with battery, motors, controller, electric side lamps and horn, and can run at good speed under its own power. Although now fitted with wire spokes, it is the intention to produce it for the coming year with artillery type wheels. The company's principal production in the motor car line could not be displayed at the show, but consists of pedal-operated pushmobiles, as they have been popularly dubbed. The toy stores are full of these just at the holiday season. The latest wrinkle in them, besides constructing them with hoods in close imitation of the bonnets of the most popular and latest real cars, is the placing of dummy cylinders under the hood, which is made so that it can be opened.

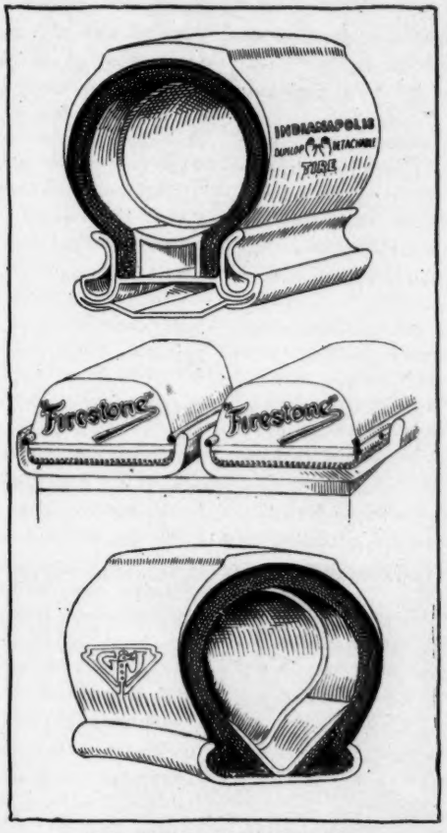
**Baker & Ringler Co.—Horns**

Reed horns for motor cars, motor cycles and bicycles are shown by this manufacturing concern in the stand of the American Metal Wheel and Automobile Co.

**A. R. Mosler & Co.—Spark Plugs**

The well known Spit Fire spark plug in their various sizes and different threads are exhibited, together with the Mosler self snap spark and throttle control levers with their notched quadrant and rods, the Mosler eccentric timer, the Mosler current distributer and the transparent dash board ignition outfit marketed under the same name. In the dash outfit is contained a spark coil, distributor, timer and switch all set in a cast with glass front ready to be attached to the dash and connected up to the plugs after the necessary ground connection has been made.

INDIANAPOLIS TIRE




FIRESTONE'S SOLID DUAL TIRE
ONE OF THE NEW G & J TIRES

**Allen Auto Specialty Co.—Tire Holders**

Tire-holding devices for extra tires are shown, together with water-proof tire covers made of canvas and having snap fastenings that are very quickly and easily manipulated. The latest Allen tire holder is made of heavy brass of a form to hold two tires side by side on the running board. This is set down into the running board until the edge is flush with the top of the board, so the holder will not cut and chafe the tires. Then there is a hinged plate that closes down over the tires and locks with a Yale lock, preventing theft of the tires. Straps and supplemental holders hold the tires snug against the dash and driver's seat.

**G & J Tire Co.—Tires**

In section L at the east end of the balcony is located the stand of the G & J Tire Co., which features its oval raised tread tires in both the G & J and Indianapolis Dunlop styles. The idea in making the upper curve of the fabric slightly oval, which gives the tire a slightly flattened appearance and the shape it assumes in service, is to relieve the fabric of all unnecessary bending action. It is asserted that the loosening of the rubber cover from the fabric at the sides of the tread of the tire is due largely to the severe bending of the fabric at these points. In the G & J tire, next the fabric, is placed a cushion of fine Para, while there is a very tough tread. The Para is intended to relieve the fabric of much of the force of the blows received on the road. The flap is one of the features. The Indianapolis Dunlop has the same fabric and materials and is cured in open steam in one operation by slow heat.

**Lipman Mfg. Co.—Oil Pump, Etc.**

Gear and vane water circulating and oil pumps and a new speed indicator comprise the display to be made by this company as soon as its shipments are received early in the week. The line of pumps is already well known to the trade, but the speed indicator is new.

**Firestone Tire and Rubber Co.—Tires**

Previously the Firestone Tire and Rubber Co. made only the Firestone mechanically fastened pneumatic tire in the pneumatic tire line, but at this show it is exhibiting a general line of air tires. Two types of solids are displayed—the single solid side wire and the Dual type solid side wire. The former is for channels 2½ to 8 inches, which is generally used on commercial rigs. The tire is constructed with cross wires vulcanized in the rubber near its base and made an actual part of it. Two endless retaining wires resting on the shoulders formed by the cross wires hold it in the channel. The Dual is formed by applying two singles of any width to the same wheel, ⅜-inch apart. It provides four fastenings for the tire equipment of each rear wheel, presenting a greater surface, which affords more escape for the rubber under pressure, greater resiliency and quicker radiation of heat. The two treads are designed to prevent skidding. Claim is made that accidents to Dual tires seldom affect both tires at the same time and that either can be treated without interfering with the other.

N. H. Van Sicklen, Manager

MOTOR AGE

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309 Michigan Avenue, Chicago

Published Every Thursday by the Trade Press Company
Subscription Two Dollars a Year Foreign Subscription Four Dollars

The Western News Company of Chicago and Its Branches Supply Newsdealers

New York Office
29 West Forty Second Street

Entered at the Chicago Postoffice as Second-Class Matter

Official Organ of the
American Motor League

# AMERICA'S EARLY SHOW ILLUSTRATES TENDENCIES

AMERICA'S motor car world is sitting in judgment today; it is trying several issues at one and the same time, but is hearing only one side of the case now. The other side will be prepared to present its evidence a month or so later.

After all the testimony has been presented the question of early or late shows will have been determined—probably. There is no certainty this court will not reverse its own decision; courts have been known to do such things.

There are other questions of more import, even, than that of Early vs. Late Shows, that are to be settled. These include certain differences of opinion on the number of cylinders to be employed in motor car power plants, correct frame and spring design, and numerous other matters of a mechanical nature that have come up for serious consideration by designers and makers within the past year.

America's first show of national character for the season of 1906-7 opened Saturday night in Grand Central palace, New York. It is the exhibition of those makers who do not operate under the Selden license, commonly termed independents, whose numbers are growing very rapidly and are helping to build up a great industry—an industry that bids fair to be second to none in the manufacturing line in this country.

The opening of the exhibition was, as all shows are, incomplete up to the last minute; it was, as all shows are, attended by an immense throng of people—some mechanics, some purchasers, some agents, a few faddists.

The building which houses this, the first of the season's shows, is inadequate though acceptable. It is like all buildings devoted to motor car shows—too small. This particular structure is not New York's Madison Square garden or Chicago's Coliseum, but buildings do not always make shows.

It is like other shows to a great extent—the decorations are attractive, the crowds are great, the enthusiasm of the people is intense, the exhibitors are optimistic to the extreme.

People who flock to the exhibition hall are shown wonderful things in motor cars and accessories; they are shown new cars and new devices in such great quantities as to cause bewilderment; they are shown improvements in design, in construction, in finish, in equipment, in material and in workmanship.

They are offered motor cars that are powerful, reliable, beautiful, and at prices that will fit the pocketbook of almost any ordinary American citizen who wants a machine of his own.

They are not confronted with cut price signs, for in one sense prices have not dropped, though the average non-motoring man asks "when will the price come down?" Instead, the public is given the benefit of the years of experimenting and experience the makers have to their credit; it is given better and especially-made motor car material; it is given refinement all the time; it is given more careful workmanship—in short, it is given the best that money, time, ingenuity and experience can give—for approximately the same amount of money that was paid for the crudest form of road locomotive that could be found on the market a few years ago.

STILL FIND USE FOR THE HORSE

There is no progress without changes, and changes are abundantly in evidence; but they are not of the radical sort. In a general way the motor car has reached a satisfactory stage in the matter of design; henceforth alterations will not be so common as they have been; today there is an accepted standard.

The exhibition at Grand Central palace includes over 250 cars and chassis—the count on the opening night was 248—and there were many cars still to be brought in.

High-powered runabouts show popularity, as Motor Age predicted they would, nearly every concern of note having a model on view. Enclosed cars—limousines, landaulets, demi-limousines—are in demand; at least the number shown indicates this.

Multiple disk clutches are on the increase in popular favor; unit construction is everywhere apparent—some houses even going so far as to enclose the driveshaft.

Combination internal and external hub brakes, full elliptic springs, larger and straight line bodies, larger fuel tanks, chrome nickel steel frames, cylinders cast in pairs, selective type of speed change gears, enclosed gears, larger wheels and tires, improved and more dependable lubricating devices—heavier construction in the running gear parts, are some of the tendencies.

No question of construction or design is more discussed than that of the number of cylinders. There were over fifty six-cylinder cars exhibited at the Olympia show in London; only a few are seen in New York. Most of the makers of six-cylinder cars, however, happen to be in the Association of Licensed Automobile Manufacturers, so that the Madison Square garden show must be awaited to tell the story of the six.

Summing up the case as it now appears, there is a tendency to depart from freak construction; the public wants something simple yet serviceable, not necessarily a good deal for the money but a little that is very good for the money. It has come to realize that a motor car is a business proposition and not so much of a plaything as has been imagined; therefore it wants something that is businesslike and looks businesslike; it is through with jimcracks and gingerbread effects and is ready to buy substantial products from American makers.

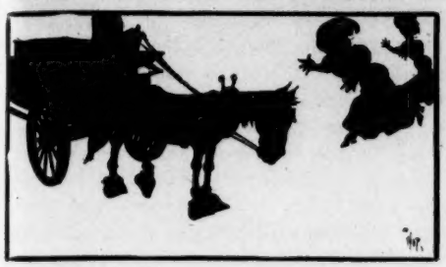
The commercial section of this show is a disappointment, but it may be true that, as is stated, most of the makers of commercial vehicles are too busy filling orders to waste time making exhibits and attending shows.

This rather small exhibition of commercial motor cars, however, does not in the least detract from the importance of this branch of the industry; as a matter of fact the commercial end bids fair to be the most important of all.

Such is the situation as viewed from a casual survey of the ante-holiday exhibition; the post-holiday affair may alter the apparent situation. Until this side of the case has been presented, final judgment must be reserved.

# JUMP SPARKS

## NOT THE RIGHT DAISY



E. A. Hudson, a Syracuse, N. Y., business man, recently decided to take up motoring, bought a machine, engaged a driver and sold his big, white family horse, Daisy, to Judd, the baggage man. Having been attached to Daisy for many years, the women of the family refused to engage in motoring and for some time stated they could not bear the thought of going down town and see Daisy drawing around a baggage wagon. After a while, however, they summoned up courage and with a lot of lump sugar went down to the New York Central station to hunt up Daisy. The merchant's wife saw a white horse attached to a baggage wagon and immediately she rushed up and began to caress the horse. "You poor girl," said the woman of the house, "your nice, pink face is all dirt, and to think that you should have to draw this big, heavy wagon. It is just as mean as it can be to think that an old motor car should separate us." She was about ready to have a good cry when the baggage man rudely broke in with the curt statement that the woman was wasting her emotions on the wrong horse and that Daisy had been shifted and was drawing the Vanderbilt hotel bus.

While all these 1907 models of motor cars are coming out, why not bring out some 1907 models of motoring terms? Motoring Illustrated, of England, says it sounds better to say motor house for garage and driver for chauffeur, an idea that is prevalent in this country also. But while we are about reforming the language, why not make it motor car instead of automobile? At the same time cut out that horrible expression "auto."

The French are not licked yet by any means, as was shown at Olympia, when the English, on their own battlefield, could scare up only eighty more cars than the French makers had on view. Will the English do as well at the Paris show?

Professor Herkomer will have to move over and give Emperor William half the motoring seat.

The Long Island parkway has to take a sidetrack until the show special dashes past on its way to motoring history.

The American motor car is now fighting to make its foreign rival doff its bonnet to Yankee superiority.

Many a man missed his Thanksgiving dinner at home because of the show.

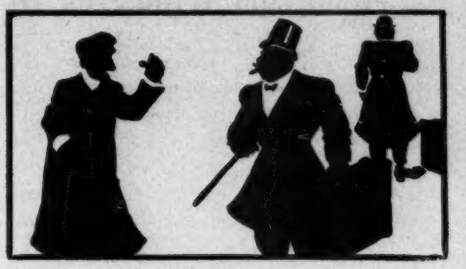
Mr. H. T. Magneto and his brother, Mr. L. T. Magneto, are among the visitors at the Grand Central palace this week.

The motoring pioneer list has been closed, but there is time to get in on the ground floor in the aeroplane game.

Never before did so many letters of the alphabet get such an outing. The N. Y. M. C., A. M. C. M. A., A. C. A., A. M. L., A. A. A., A. L. A. M., L. I. A. C. and the P. M. F. certainly occupy the center of the stage this week. W. K. V., W. J. M., A. R. P., D. H. M. and that bunch are in the background for awhile.

An opinion by an English critic who took in the Olympia show may prove gratifying to the air-cooling brigade. This critic says: "The Standard company shows a four-cylinder air-cooled motor. This is the first air-cooled motor we have seen fitted to an English car. Americans have made a study of the type, and we predict the eventual entire suppression of water-cooling. The simplification and lessening of weight are factors important enough to cause British designers to study the air-cooled motor."

## EDUCATION REQUISITE



A story that is floating around Washington, D. C., concerns United States Senator Elkins, of West Virginia, and Elliott Hough, of the Pope company, of Washington. Senator Elkins is a millionaire several times over but he has a due regard for getting his money's worth. A little while ago he decided to get a motor car and he thought a Pope-Toledo would suit him. He asked for demonstration after demonstration, up hills, through sand, at all speeds and under all conditions. After a week he sent for his son to come over from New York. The son came and put the car through its paces for another week. Then it came time for the son to go back to New York and Hough took the senator and his son to the station in the car. He tried to clinch his order on the way down, but got no satisfaction. When they reached the station Hough said: "Good-by, senator; I must go now." "Why?" asked the senator; "Where are you going?" "Oh," Hough replied, "I am going to take this car back to the garage and teach it to read and write. Those are the only requirements you haven't demanded and I guess I'll have to get in line to close the sale."

Now that the smoke of battle has cleared away in England it is seen that the shaft drive has licked its chain rival, that the six-cylinder is coming so fast that the four can almost hear the patter of its feet, that battery ignition continues to hold its place in the estimation of the public, that the average price of the foreign car is a trifle less than $3,000 and the average horsepower a shade over 27.

John Bull needn't feel so puffed up just because he had 290 exhibitors at his show. Something like 230 exhibitors are now showing in the Grand Central palace, New York, and that's only one of the American shows and half our strength.

Rome and all the roads leading to it never could compare with New York the present week. Mecca, too, would have to quit business.

The six-cylinder chicken soon may come home to roost, according to foreign reports of the Olympia show in London.

# FIGURES PRICE OF FREE ALCOHOL

## Government Expert Cannot See How Denatured Product Can be Turned Out at Less Than 40 Cents a Gallon at First—Monograph Written by Dr Wiley

Washington, D. C., Dec. 1—"When industrial alcohol is made at a price at which it can compete with petroleum and gasoline it will doubtless be preferred for illumination, heating, motive power and in the manufacture of certain commodities, because of its greater safety and more pleasant odor. Under the present conditions it is not probable that industrial alcohol can be offered upon the market at much less than 40 cents per gallon of 95 per cent strength. It is believed, however, that by paying attention to unused sources of raw materials and increased production thereof with improved methods of manufacture and denaturing the price can be very much diminished. As the price falls the quantities used for industrial purposes will correspondingly increase.

"The benefits which are to accrue from the use of industrial alcohol free of tax have probably been overestimated by the people at large, but that material benefits will accrue is not a subject of doubt. These benefits will come not suddenly but slowly, as agricultural products are more abundant, technical methods of manufacture improved and the methods of utilizing the industrial alcohol better understood. Our people should not, however, be disappointed should many years elapse before the magnitude of the product used for industrial purposes reaches the figure already attained by Germany and some of the other European nations."

The above is contained in a monograph on industrial alcohol, sources and manufacture by Dr. H. W. Wiley, chief of the bureau of chemistry of the department of agriculture. The term "industrial alcohol" is used for brevity and also because it differentiates sharply between alcohol used for beverages or for medicine and alcohol used for technical purposes in the arts and industries. The process of rendering alcohol unsuitable for drinking is called "denaturing," and consists, essentially, in adding to the alcohol a substance soluble therein of a bad taste or odor, or both, of an intensity which would render it impossible or impracticable to use the mixture as a drink.

Industrial alcohol therefore is a product which is the joint work of the farmer and the manufacturer. The function of the farmer consists in the production of the raw materials from which the alcohol is to be made. The manufacturer takes these raw materials and converts them into alcohol. This is done under the supervision and control of the bureau of internal revenue of the treasury department. Thus, in point of fact, three different agents of activity are interested in the production of industrial alcohol—the farmer, the distiller and the internal revenue officer.

The number of substances which have been mixed with alcohol to denature it is extremely large. The materials and the quantities which are employed depend upon the purposes for which the denatured alcohol is to be used. There are many technical uses of alcohol, however, in which the pure alcohol only can be employed, and it is a question to be decided by the internal revenue bureau whether such use of pure alcohol can be permitted under the existing law.

The raw materials from which alcohol is made consist of those crops grown upon the farm which contain sugar, starch, gum and cellulose or woody fiber capable of being easily converted into a fermentable sugar. The monograph then goes on to relate in great detail the different roots, plants, vegetables, etc., from which alcohol can be derived, and says the crop which at the present time is the source of almost all of the alcohol made in this country is Indian corn. The estimated acreage of this crop in 1905 was 94,011,369 acres and the yield 2,707,993,540 bushels. A bushel of corn weighs 56 pounds and the total weight of fermentable matter therein is about 39 pounds. The weight of the alcohol which is produced under the best conditions is little less than one-half of the fermentable matter. Therefore the total weight of alcohol which would be yielded by a bushel of average Indian corn would be, in round numbers, about 19 pounds. The weight of a gallon of 95 per cent alcohol is nearly 7 pounds. Hence 1 bushel of corn would produce 2.7 gallons. If the average price of corn be placed, in round numbers, at 40 cents a bushel the cost of the raw material—that is, of the corn—for manufacturing 95 per cent industrial alcohol is about 15 cents a gallon. To this must be added the cost of manufacture, storage, etc., which is perhaps as much more, making the estimated actual cost of industrial alcohol of 95 per cent strength made from corn about 30 cents per gallon. If to this be added the profits of the manufacturer and dealer it appears that under the conditions cited industrial alcohol, untaxed, should be sold for about 40 cents per gallon. A bushel of potatoes weighing 60 pounds will yield approximately 3.6 quarts of alcohol. Dr. Wiley figures out that potatoes will have to be produced at a cost not to exceed 15 cents per bushel before they can compete with Indian corn for the manufacture of industrial alcohol.

The stalks of sweet corn, field corn and sorghum contain large quantities of sugars and also considerable amounts of starch at the time of the hardening of the starch in the seeds. If these stalks could be used economically they would add largely to the raw materials from which alcohol could be made. The technical difficulties, however, attending the utilization of the stalks are so great that it is doubtful whether means can be devised whereby their use may be made profitable for alcohol making. Notwithstanding this it is a matter which is well worthy of investigation, because if stalks of sweet corn and field corn could be utilized they would place at the disposal of the manufacturer an almost inexhaustible source of raw material from which alcohol might be made.

The utilization of the waste materials from the sugar factories and sugar refineries for the purpose of making alcohol is a well-established industry. Placing the total output of sugar in the United States at 400,000 tons, beet and cane combined, would give a yield of molasses of 25,000,000 gallons. It requires 3 gallons of such molasses to make 1 gallon of industrial alcohol. There are a great many waste products in the fruit industry, as well as in the canning industry, and it is proposed to use these for the manufacture of alcohol. Dr. Wiley doubts if such use would be profitable.

### BIG CLIMB IN EAST

Providence, R. I., Dec. 3—The third annual hill-climbing contest of the Rhode Island A. C. was held Thanksgiving day over Reservoir hill near here and proved a big success. L. F. M. Baldwin won the Knight cup for the second time and one more victory makes it his property. He drove a Stanley and made the best time of the day, 1 minute ⅝ second for the climb. J. R. Harding, of Boston, drove his big Mercedes into a ditch to prevent hitting a crowd of spectators and damaged the machine so it could not compete. He had just completed repairing it at a big expense, it being the same car that was overturned and burned at Readville here May 30. Summary:

Class 1, steam runabouts—Won by L. F. M. Baldwin, 20-horsepower Stanley; time, 1:00 3-5; B. F. Blackinton, 20-horsepower Stanley, second; time, 1:00 4-5.

Class 2, steam touring cars—Won by B. F. Blackinton, 20-horsepower Stanley; time, 1:17 1-5; L. F. M. Baldwin, 20-horsepower Stanley, second; time, 1:17 3-5; Percy Blackinton, 20-horsepower Stanley, disqualified.

Class 3, gasoline cars costing $1,000 or less—Won by C. C. Edwards, 16-horsepower Cameron; time, 1:55 1-5; D. W. Flint, 18-horsepower Ford, second; time, 2:04 3-5; L. C. Tingley, 10-horsepower Maxwell, third; time, 2:14.

Class 4, gasoline cars costing $2,000 or less—Won by H. S. Wolfe, 20-24-horsepower Jackson, first; time, 1:50; R. L. Lippitt, 12-horsepower Franklin, second; time, 1:59 1-5; D. W. Flint, 15-horsepower Ford, third; time, 2:03 1-5; G. S. Morse, 10-horsepower Maxwell, fourth; time, 2:27 4-5.

Class 5, gasoline cars costing $3,000 or less—Won by H. A. Capron, 25-horsepower Pope-Hartford; time, 1:28; E. F. Jones, 35-horsepower Stoddard-Dayton, second; time, 1:38 2-5; W. W. Whitten, 35-horsepower

Rambler, third; time, 1:49; E. P. Blake, 20-24-horsepower Jackson, fourth; Time, 1:51 3-5; C. D. Snow, 20-horsepower Stevens-Duryea, fifth; time, 3:00.

Class 6, gasoline cars costing $5,000 or less—Won by Elliott Flint, 30-horsepower Packard; time, 1:16; J. L. Snow, 30-horsepower Peerless, second; time, 1:26; J. P. Grady, 25-horsepower Pope-Hartford, third; time, 1:27 1-5; Ed Sweeney, 35-horsepower Stoddard-Dayton, fourth; time, 1:36; John Shepard, Jr., 40-45-horsepower Columbia, fifth; time, 1:41; E. P. Blake, 20-24-horsepower Jackson, sixth; time, 1:50; R. Berry, driver Welch, 25-horsepower Pope-Toledo, sixth; time, 2:38.

Class 7, gasoline cars costing more than $5,000—Won by W. P. Mather, 60-horsepower Fiat; time, 1:24 1-5; E. D. Snow, 50-horsepower Stevens-Duryea, second; time, 1:25 2-5; J. L. Snow, 45-horsepower Peerless, third; time, 1:28 2-5.

Class 8, free-for-all—Won by L. F. M. Baldwin, 20-horsepower Stanley steamer; time, 1:01 3-5; B. S. Blackinton, 20-horsepower Stanley, second; time, 1:04 4-5; J. P. Grady, 25-horsepower Pope-Hartford stripped racing car, third; time, 1:14; Jeff Crawford, 60-horsepower Fiat, fourth; time, 1:22 4-5; J. L. Snow, 45-horsepower Peerless, fifth; time, 1:26 1-5.

### BEST TIME BY STEVENS SIX

Los Angeles, Cal., Dec. 1—Special telegram—The Stevens-Duryea six-cylinder captured the perpetual challenge cup in the free-for-all class in the second annual Riverside hill-climb up Box Springs mountain Thanksgiving day, winning the class in 5 minutes 41¼ seconds. The climb attracted seventy-two entries. Rain in the morning caused a postponement until the afternoon. The course was 3½ miles in length. Summary of the climb:

Runabout costing $850 and under—Won by Ford; time, 7:50¼; Maxwell, 8:48 4-5, second.

Runabouts costing $1,250 or less—Won by the Buick; time, 6:32 1-5; Tourist, 7:11 4-5, second; Mitchell, 7:14, third. Also finished: Jackson, Reo, Tourist, Ford.

Touring cars costing $1,600 or less—Won by Buick; time, 7:02 1-5; Mason, 7:19, second; Buick, 7:19¼, third. Also finished: Buick, Tourist, Jackson, Tourist, Tourist, Buick, Cartercar, Elmore.

Touring cars, $2,500 and under—Won by Tourist; time, 5:57; Cadillac, 6:47¼, second; Buick, 6:57, third. Also finished: Buick, Cadillac, Elmore, Rambler, Mitchell.

Free-for-all, touring cars—Won by Stevens-Duryea six-cylinder; time, 5:41¼; Packard, 5:50, second; Thomas, 5:54, third. Also finished: Tourist, Oldsmobile, Cadillac, Maxwell, Mason, American Mercedes.

Free-for-all, runabouts—Won by Tourist; time, 5:44 1-5; Buick, 6:35, second; Aerocar, 6:45, third. Also finished: Elmore, Tourist, Pope-Toledo, Buick.

### FRANKLIN IN CONTROL

Syracuse, N. Y., Dec. 3—Herbert H. Franklin last week secured the controlling interest of the H. H. Franklin Mfg. Co. Mr. Franklin, Giles H. Stilwell, John Wilkinson and F. A. Barton, who are actively engaged in the management of the plant, purchased most of the holdings of Alexander T. Brown, W. C. Lipe and H. W. Chapin. All three of these are interested in the Brown-Lipe Gear Co., to which they expect to devote their entire attention in the future. Mr. Franklin bought the biggest block of the stock sold, while F. A. Barton, assistant manager, Giles H. Stilwell, attorney, and John Wilkinson, engineer of the company, increase their holdings. Mr. Brown retains enough of his stock to continue to be president of the company and Mr. Lipe to be vice-president.

## KAISER GIVES A CUP

### Trophy Presented by William To Be Competed for in International Race in Germany

Berlin, Nov. 22—At the conclusion of the tour for the Herkomer trophy next June there will be an international racing competition for the Imperial cup, presented by Emperor William to the Imperial Automobile Club of Germany. No definite date has been set, but in all probability the route will include the Taunus circuit, over which the 1904 Bennett cup race was run. The distance will be about 312 miles. Although each maker can enter three cars, the committee in charge of the event has the right to cut this to two from each factory in case the field is too unwieldly. The entry fee is $600 and the lists close December 31 with the Imperial Automobile Club, Leipziger platz, Berlin. Drivers must be named before May 1 and cannot be changed during the contest. The regulations, just issued, are as follows:

The total cylinder volume must not exceed 16.904 inches.

The minimum distance from the back edge of the dashboard to the middle of the rear axle must be 78.74 inches.

The wheel base may not be less than 118.11 inches.

The dashboard must be upright.

The distance from the back edge of the dashboard to the back edge of the bucket seats of the two seated racing bodies may not exceed 60 inches.

The height of the two unupholstered seats measured from the edge of the frame may not be less than 13 inches.

No conditions govern the position of the gasoline tanks.

The cars may not weigh less than 2,589 pounds, including racing body and tires, without gasoline, water and oil, without spares and tools, but with oil and grease in the motor and change-speed box, with dashboard, bonnet, dust guard under the engine with muffler, wood wheels and two brakes, working independently.

There must be a clearance of at least 6 inches between the ground and the lowest part of the car.

Every engine must possess a reverse operated by the motor.

Gasoline of a specific weight of 680 to 720 alone is permissible as fuel. Any additions are forbidden.

Detachable rims are permissible.

The exhaust must be carried horizontally to the rear in such a way as not to raise any dust.

At the weighing-in the manufacturers must prove by means of official papers that the cars entered are in accordance with the police regulations of their country, and the drivers must show their licenses. Every car must contain two adult persons seated side by side, and of normal weight. Every taking-in of fuel, all changing and repairing of tires, tubes, engine, gear, etc., may only be carried out by the occupants of the car. Two places on the route, to be decided by lottery, will be pointed out to each competing firm for its repair station. No workmen or employes of competing firms are allowed on the course itself. Fuel and spares may be laid down on the edge of the road, but may only be used by the passengers. It is permissible to take in only tires, tubes, water, oil, gasoline, etc., at the stations. Non-competing firms, interested in the race, such as tire companies and others, can also have two stations placed en route on payment of $200. Of course this will not detract from the interest taken in the Herkomer—not this year at least. The professor has the start on the kaiser and his event is now so well established that it would take a lot to oust him from popular favor.

### FIRE IN A POPE PLANT

Toledo, O., Dec. 1—The Pope Motor Car Co. suffered an estimated loss of about $12,000 as the result of a fire of unknown origin at the local plant this morning, a one-story frame sand blast and storage house, together with three Pope-Waverley motor trucks and twenty-two car bodies, being destroyed. William Lininger, the night watchman, first discovered the blaze and turned in an alarm at 1 o'clock. The flames made such rapid headway that for a time it looked as if the entire Pope-Toledo plant would be doomed to destruction. A second alarm was turned in 19 minutes after the first one, and through the heroic efforts of the firemen the plant was saved. A naphtha house, containing several hundred gallons of benzine, stood within a very short distance from the burning structure, and if this had ignited, it would have been beyond the efforts of the firemen to save the plant. A heavy stream of water prevented the flames from reaching the naphtha house, thus confining the loss of the company to the one building and its contents. It is announced that the fire will not inconvenience the Pope company in the least.

### BREYER TO RUN RACE

Paris, Nov. 23—The Automobile Club of France has definitely decided to turn over the organization of the 1907 grand prix to Victor Breyer, the club to contribute $8,000 toward the expenses. Rules of the races as previously outlined in Motor Age were adopted. One new point, though, was the decision to allow makers of tires and accessories to enter cars. Tire makers, to be eligible for a prize, will have to have their cars averages within nine-tenths of the time of the winner of the grand prix. By desire of the German emperor, the organizer of the Taunus tourist international race in Germany is proceeding to Paris to confer with the organizers of the grand prix, in order to obtain full information regarding the details of the same. The De Dion-Bouton company has already decided to enter for the Taunus circuit a number of eight-cylinder cars, of which the cylinders, inclined at 30 degrees from the vertical, will be cast in two series of four each. The car will develop 60 horsepower and is a bona fide tourist machine. This is the first appearance of an eight-cylinder motor in a tourist car made by a first-class French firm.

# OLYMPIA SHOW ANTICIPATES PARIS SALON

## French Makers, Fearing Loss of English Trade, Exhibit Their Latest Motor Creations, Designed for the Paris Salon

## Exhibitors Number 290—British Show 282 and French 202 Cars—Number of Six-Cylinder Machines Increases

London, Nov. 21—A more leisured survey of the Olympia show discloses how completely the London exhibitor has anticipated the Paris show. Last year the French makers almost to a man refused to supply their concessionaires on this side with the 1906 models in time for Olympia on the ground that, being in preparation for the Paris show, they were not ready for London. But the Germans came along and the Italians and the resultant trade at the Paris show was apparently not comforting, for with but one exception every French manufacturer represented in the Olympia show has sent across not merely his 1907 models, but the actual finished chassis which he intends to exhibit at the Paris salon. It is a very complete surrender, but is taken quite as a matter of course and very little reference is made to the circumstance in the press. The Britisher prides himself that he is good at winning or losing and considers it bad form to squeal or crow.

A careful estimate made today discloses the following interesting data:

Total number of exhibitors 290, divided as follows: Motor car manufacturers and agents, 151; tires and accessories, 127; publishers, 12.

Different makes of motor cars, 142; total number of cars and chassis, 596, divided as follows: British, 282; French, 202; Italian, 35; American, 29; Belgian, 21; German, 20; Dutch, 5; Swiss, 2.

Average horsepower per car, 23.7; total value of cars, $1,749,260; average cost per car, $2,935.

Gasoline cars, $575; steamers, 14; electrics, 7; total, 596.

Number of cylinders—One, 32; two, 57; three, 11; four, 416; six, 56; eight, 3.

Transmissions—Chain drive, 197; shaft drive, 378.

Ignition—Storage battery, 197; high tension magneto, 125; low tension magneto, 114; dual, 139.

So far as one can gather the trade done direct with the public during the present show is about equal to last year's, but the wholesale business has increased so greatly as to prompt one to suppose that most of next season's output has now been traded away.

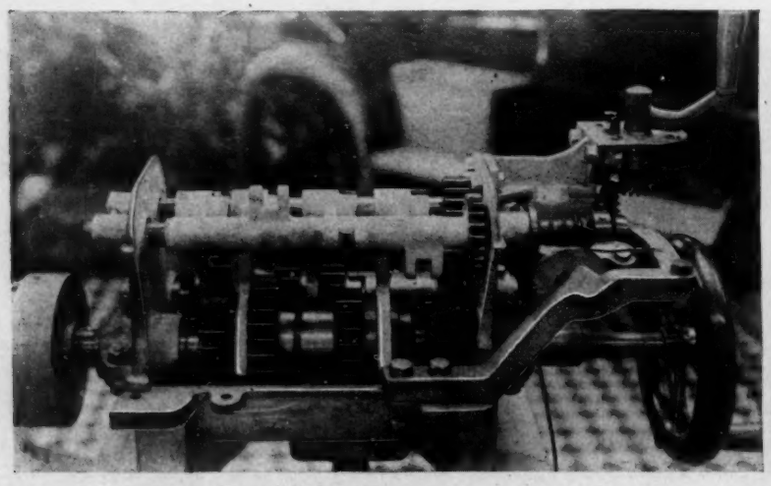
PILAIN OILER AND COLD AIR BRAKE

Humbers announce orders for their new type Coventry car amounting to almost 1,000 cars. Darracqs have done very heavy business, as have Wolesleys, Swifts, Daimlers, Talbots. But the feature of the show so far has been the demand for six-cylinder cars. The Napier leads the way, naturally, the show chassis being a perfect work of art, looking more like gold and silversmiths' work than engineers'. It is said over a hundred Napier six-cylinders were definitely ordered up to last night, or equivalent to about $600,000 worth. But even the minor firms have done extraordinary business. One order book for a British firm that has not yet really made a reputation shows that over 100 cars had been contracted for since the opening of the show, or practically 5 months' output. The little four-cylinder Ford is attracting considerable attention and selling very fairly at $600 and about a hundred orders have already been placed.

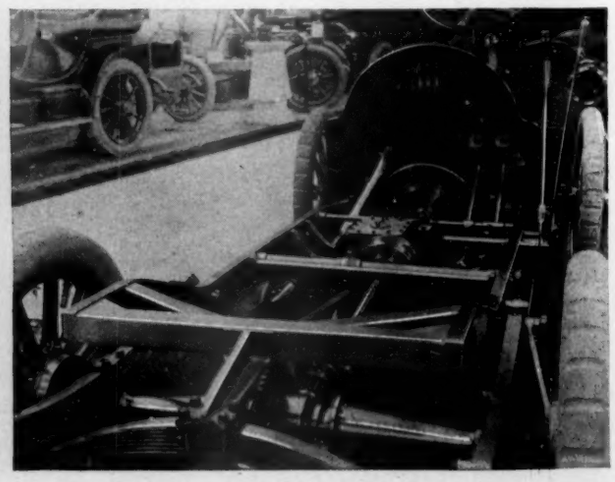
The mechanical features noticeable apart from the prevalence of the live axle type of transmission are the diversity in clutches. A year ago the disk type seemed destined to clean out all competitors in cars of any price, but it has not. Indeed, it has almost lost ground, being dropped by some firms in favor of a single metal-to-metal cone and by others for the old leather-faced variety. The latter, however, is very much improved in the matter of frictional surface and in the facilities given to admit of replacement of the leather. The type that has advanced undoubtedly is the metal-to-metal cone, although the Mercedes copy is to still stick to the scroll and others to the expanding type. A few have adopted a band clutch, notably the Mors, but the metal cone is on the ascendant.

In suspensions the fire-spring design is rapidly carrying all others before it. Last year the three-quarter elliptic form of rear suspension was de rigeuer, the quarter spring taking the place of the rear spring hanger. This still holds, but the transverse inverted semi-elliptic spring supporting the rear cross member of the frame at its center and joining the rear ends of the semi-elliptic spring at its extremities is the most accepted type. Springs have become somewhat longer and with more leaves. In bodies it is evident the days of open motor cars are nearly gone. Every car is now equipped to take a hood or some form of overhead protection, while doors are being fitted to the front seat space.

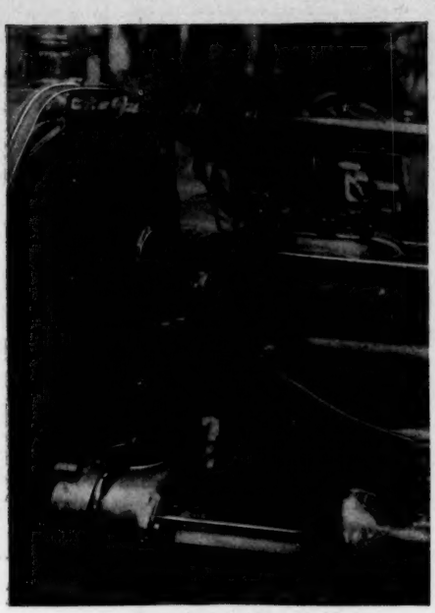
The number of trade visitors from across the channel has been very large. A small knot was noticed yesterday consisting of Count Rene de Knyff, Clement, Darracq,



MITCHELL NEW TYPE OF SELECTIVE GEAR



UPSWEEP IN GREGOIRE FRAME



FIAT SPECIAL GAS PUMP

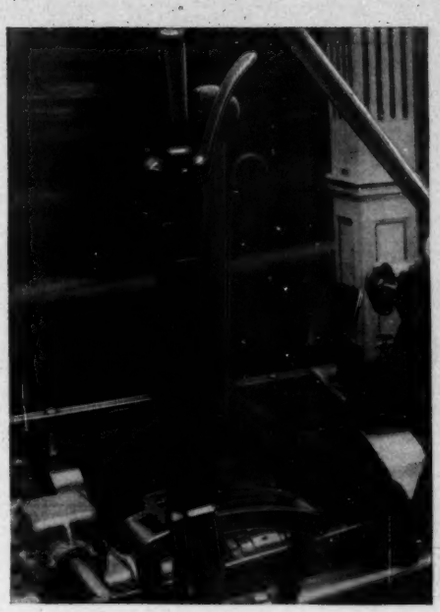
Kellner, Baron Turckheim and some others.

The new Pilain has something of a novelty in the way of a lubricator, consisting of the sight feed being located on the back of the dash. This is let into the dash, so that it is flush with the center thereof. The drips are operated by a hand lever, in addition to the usual ratchet adjustment, so that when the engine is running at slow speed a minimum supply of lubrication may be given or correspondingly increased as the motor speed is increased. The Pilain motor still retains what is known as a cold air brake. An operating lever is supported by a ratchet arrangement attached to the steering post, so that the fuel supply can be cut out and cold air only permitted to pass into the combustion chamber, and against this air the pistons work and thus act as a brake on the car.

A four-cylinder landaulet cab, which is exhibited by the Mitchell works, has a novel type of selective gear. The gears are controlled through a hollow steering pillar and have been made practically fool-proof. A small hand lever working over a distance plate, in which is plainly set out the gear which is in operation and covered by the lever, is all the driver has to handle. The gears are not put into operation until the clutch is released and again engaged. Then, by means of a spring-operated shaft, which is controlled through a hand lever on the steering wheel, the proper gear is brought into mesh. When the clutch pedal is released the turning of the motor shaft brings dog clutches on the faces into operation, thereby locking the gears.

The Fiat people have adopted a somewhat new method of intake pipe for their six-cylinder car. The usual Y piping from the carbureter connects with a single large pipe, which in turn is connected to the three pairs of cylinders. It is figured that by this means the extremely rapid passage of the gas to the different pairs of cylinders is avoided and that a more uniform charge, both as to size and mixture, is secured. The Fiat people also have what is called a seven-cylinder motor. This has an air pump cylinder between the motor and the radiator, designed to supply the car with an initial charge of gas, operated from the driver's seat, the charge entering the cylinders through small auxiliary valves on either side of each pair of cylinders.

The largest motor exhibited at the show is a 100-horsepower Simms, built especially for the London fire brigade. The crankcase is cast in two pieces, the bottom portion being removable. It is so designed that each connecting rod has its own splash receptacle, as well as an individual handhole to reach the bearings. The valve mechanism is on top of the cylinders and is operated through means of a horizontal shaft extending over the cylinders and is operated by means of a back of the motor. The valve mechanism on top of each cylinder is entirely encased by an aluminum cap, either side of which may be raised for the purpose of adjusting, oiling or repairing the valve mechanism. In a six-cylinder Brooke car a trigger arrangement is fitted to the shifting lever on the selective gearset. This is designed to serve as a lock for the reverse

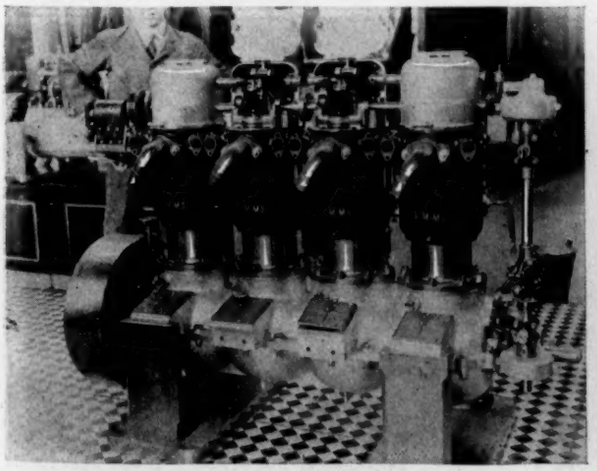


BROOKE REVERSE GEAR RELEASE TRIGGER

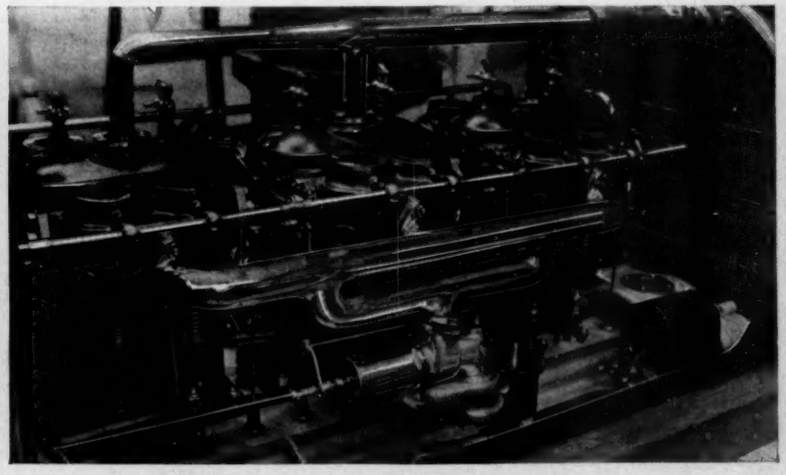
gear and, in order to mesh the reverse, the trigger must first be lifted.

Novelties are many. The Pullman detachable non-skid tire core consists of short lengths of steel-studded sections of cover held together by side pieces, one of which is provided with a dismountable rivet, which enables the cover to be dismounted also. The chain shown passes through loops in these side pieces, preventing the cover from swinging on the tire, and as the cover is put on while the tire is deflated the inflation holds it in place. There is another idea, a plug switch, which enables the driver to quickly test his ignition, cylinder by cylinder. It is simply a light brass clip with a vulcanite knobbed contact hammer.

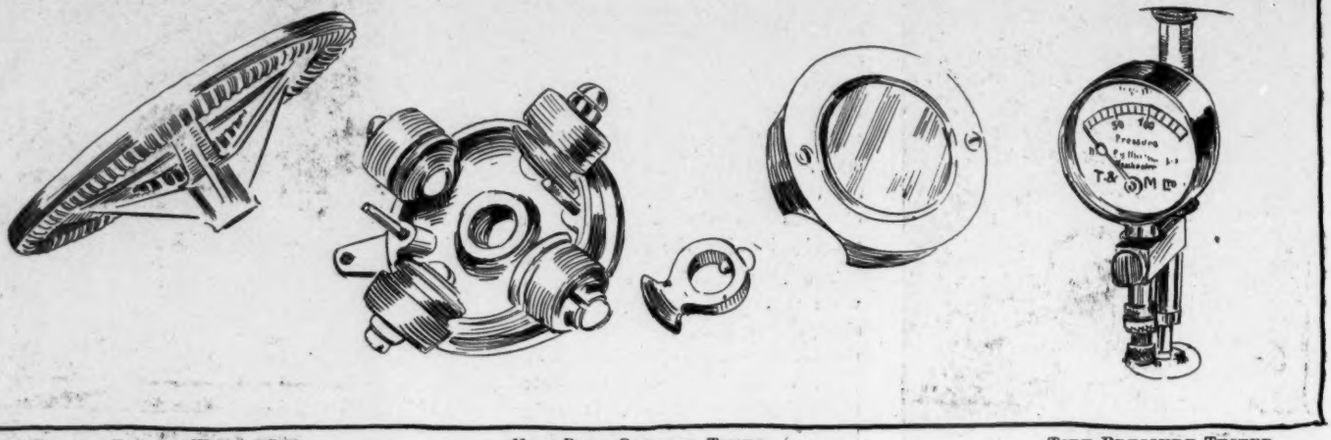
The Auto-Clipse is a device intended to enable the driver to suppress the blinding glare of his lamps when driving in traffic and yet hold the power so at a moment's notice he can throw the full flood of his illumination on the road ahead. It is secured by interposing between the lens reflector of a gas lamp and the flame a disk of dull metal which, when not so interposed, is hidden away out of sight in the



SIMMS MOTOR, LARGEST IN THE SHOW



INTAKE PIPING ON THE SIX-CYLINDER FIAT



SPIRAL RIBBED WHEEL GRIP

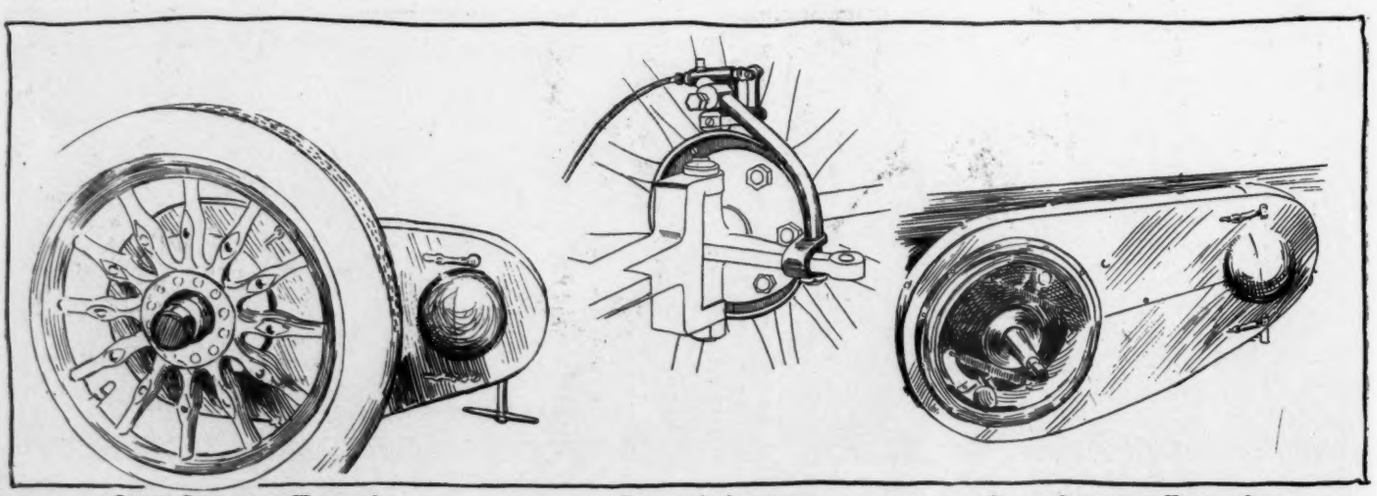
NEW BALL CONTACT TIMER

TIRE PRESSURE TESTER

cowl of the lamp. This interposition cuts away the long-distance light rays and accordingly robs the lamp of that much of its power. The disks are held up in the cowls by springs which are overcome by the operation of a steering wheel or dashboard lever-controlled Bowden wire mechanism. Quite the simplest and cheapest form of distance recorder shown was the Bowden patents. It consisted of an ordinary Veeder or similar recording mechanism fixed to the dashboard of the car. This is connected by the well-known Bowden wire mechanism to a bell crank lever so situated on one of the steering wheels that one end of it is operated by an eccentric ring fixed to the wheel hub. At every revolution of the wheel the eccentric gives the bell crank lever a push and pull which, being communicated by the Bowden wire mechanism to the recorder mechanism, a simple trip action there pulls a star wheel round one notch each time. The fitments at the road wheel end of the device consists of a round rod of mild steel having a clip at one extremity in order to fasten it to one of the steering arms of the car. For the 10-12-horsepower Coventry Humber this rod is used exactly as sent out, but in cases where it is necessary to bend the rod it can easily be done by any motor repairer or blacksmith. This rod carries an adjustable arm which, by means of a set screw, can be fixed at any desired height. It is made to carry the stop in which the outer member of the Bowden mechanism terminates, and also accommodates a bell-cranked lever working on a hardened pivot. At one end of the bell crank is a plunger carrying a length of the inner member of the Bowden flexible wire mechanism. The other end is made to take a fiber pad. Screwed to the spokes of the road wheel, or fastened to the hub flange, is an eccentric drum which imparts a rocking motion to the bell crank, thus pulling on the inner member of the Bowden wire mechanism and actuating the recorder on the dashboard of the motor car.

An adjustable lamp bracket shown can be swung in or out to give a width between the lamp bracket holes of from 4 to 10 inches, or can be set to swing with the steering wheel so as to give light where the car is going. A safety tail lamp is provided with twin lamps placed side by side in separate lamp-holders on an ebonite base. Under the base is a switch putting only the white lamp on the circuit, but should the white lamp fail the red one automatically comes in and continues the light. Many thousands of dollars has been paid in fines for lack of this device. Colored celluloid-covered steering wheels are shown on many English cars. They are weather, oil and dirt-proof and giving a splendid grip. A form of quick-acting wing nut for a security bolt to hold on pneumatic tires has the sleeve of the barrel nut split after being tapped. It is placed over the shank of the security bolt, the winged collar—which has a tapered hole—pushes down until the tapped sleeve is seated on the bolt, when the winged collar carries the whole affair in the ordinary way, as though made integrally with the sleeve.

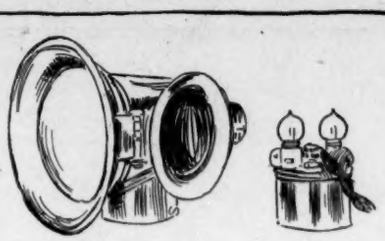
One of the neatest things in contact-breakers or commutators, as they are generally called now, is that shown by the Gratze Patents' Syndicate. It is an ordinary commutator in design save that the internal wipe works against four ball points. When contact is made the current passes from the rotary commutator to the ball points leading by controlling springs to the distributing terminus. When the wipe strikes the ball it yields on the spring and at the same time rolls in its seat, the idea being to minimize all wear and necessity for adjustment. A device intended to get rid of the unsightly bulb for the necessary hooter is a sort of spring-controlled bellows concealed in the floor board under the driver's heel, but which can be put in any suitable position if operated from the wheel. If the heel is the method of op-



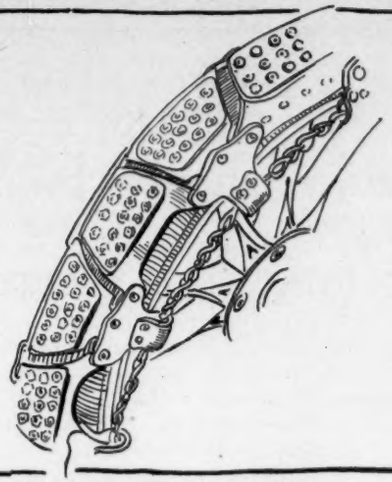
CHAIN CASE WITH WHEEL ON

BOWDEN'S ODOMETER

CHAIN CASE WITH WHEEL OFF



DOUBLE LIGHT TAIL LAMP



DETACHABLE TIRE PROTECTOR

QUICK REMOVABLE PLUG

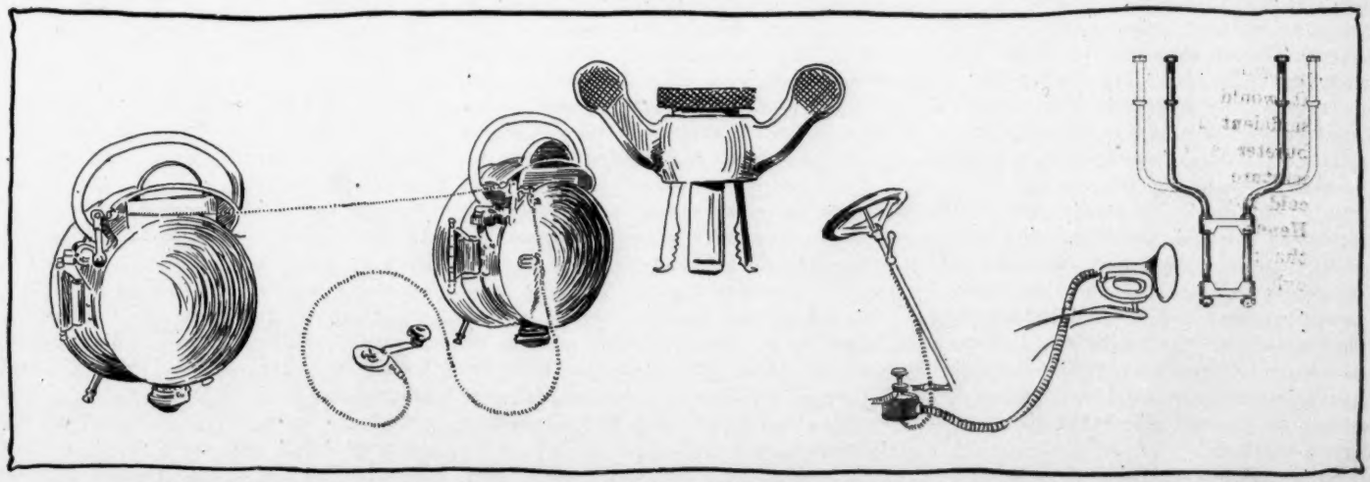
erating a suitable connection to the horn fixed to the front of the car is all that is necessary. By dropping his heel on the plunger the bellows is collapsed and the air forced into the horn. As the plunger is spring-controlled, lifting the heel refills the bellows, permitting repetition. The Bowden Patents' Syndicate shows this operated by its mechanism from the steering wheel by a small lever.

The chain as a transmission is losing ground rapidly, in England at least, only some of the older concerns clinging to it for their larger models. But it is otherwise on the continent, where the live axle would scarcely be considered were it not for the English market. The great weakness of the chain is its openness to mud and dust, consequent rapid loss of accuracy and rattle. An English firm called the Sunbeam Co. brought out and has used a chain case very successfully, but the famous French firm of Charron, Girardot & Voigt shows a very improved device of this sort. This is a chain case, detachable in three sections and completely closing in both driving chains, back and front sprockets. It is put on before the road wheel is mounted on its axle; is quite oil-tight, enabling the chain to run in a bath of oil and, by cleverly mounting the chain sprocket shaft on an eccentric bracket bearing operated by an endless screw working in a worm on the periphery of the eccentric plate, the chain can be easily and quickly adjusted for tension with a few turns of a tommy run through the head of the endless screw bolt.

The electric horn has caught on over in Europe. The latest form is shown on the Napier car. It consisted of an electric trembler with magnets, a steel vibrating disk held at its periphery by two flanges and two electro-magnets. The rapid vibrations of the disk caused by rapidly magnetizing and demagnetizing the two disk magnets produce a sound which is intensified and converted by a horn into a very pleasant, deep-toned and penetrating warning. The electric current is obtained from a pair of 4-volt accumulators linked up in series. The sound is produced by pressing a small switch fitted on the steering wheel, which closes the outer circuit. The real feature is that anyone in the car can sound the horn, there being a push-button for the driver to operate with his foot and also buttons on the sides of the body for each of the three passengers.

To correctly arrive at a basis for inflation the Gaulois Tire Co. has laid out a tabulated list of pressures for each diameter and load of tire. But to correctly gauge the pressure it had to invite the assistance of Shaffer & Budenberg, the big pressure gauge manufacturers. The usual pressure gauge is fitted to the end of the inflating pump. But this is utterly unavailable, as it only momentarily registers the pressure in the pump and even then is difficult to read quickly. The new tester consists of a pressure gauge working through a stuffing box arrangement and provided with an ordinary non-return valve. The whole device screws onto the tire valve. A milled nut plunger is then screwed home sufficiently to depress the needle valve on the tire and render it inoperative. This allows the pressure of air in the tire to be registered on the gauge, and if more pressure is required the inflator can provide it through the supplementary air valve fitted.

So far the British manufacturers are filled with pride over their great showing, it being particularly gratifying that the French makers should have been compelled to show their hands by exhibiting their very latest ideas at Olympia. It proves the contention that the people across the channel recognize they will have to fight for the trade in England. Now the question is, will the British makers go to Paris and make as brave a front in the salon as the Frenchmen have at Olympia? Those on the inside feel confident the English certainly will make the attempt and while they hardly will have many new things they have enough to make the French tremble.



LIGHT REGULATING DEVICE

HANDY LOCKING LOCKNUT

FOOT-OPERATING HORN

ADJUSTABLE BRACKET

# CONSTRUCTION—THEORY AND PRACTICE

## A Discussion Thereon by "Designer"

### DIFFICULTIES OF CARBURATION

NO other accessory to the gasoline engine has received so much attention as the carbureter; it is truly "the heart of the motor.' The demands upon it are as varied as there are makers and types of motors. In its most nearly perfect state it is remarkably imperfect. Demands upon it vary with speed, compression, valve lift and setting, quality of fuel and the mechanical perfection or condition of the motor. Given a fixed model of motor and a fairly satisfactory application and adjustment can be affected, but there is nothing stable about such setting. The slightest leak through the valve of one cylinder will throw the adjustment out, as cited in this department last week. Or a change of weather may affect it, and change of altitudes makes a marked difference in the air pressure.

Right now motorists are being subjected to more annoyance in starting their motors than they have known for a number of years. This is due to the almost complete withdrawal from the market of gasoline lighter than 64 test. The Standard Oil Co., which produces all but a small fraction of the gasoline used in motors, has concluded to put out this grade only, which will be supplied alike for all purposes and to all classes of consumers. The object is to make it possible for motorists using Standard gasoline to secure uniform quality wherever they may chance to be. This will relieve tourists, particularly, from the necessity of readjusting the carbureter every time the tank is filled from an otherwise unknown supply of fuel.

It will be found almost impossible to start a motor on a cold morning with 64 gasoline without priming the cylinders. It would seem that the air should lift a sufficient quantity of vapor when the carbureter is flooded with the tickler, but the mixture thus obtained in the majority of cold motors fails to produce an explosion. Hence the necessity of pouring through the priming cocks or relief vents in the cylinders a few drops of gasoline. Even then sometimes the motor will make only a few turns and stop, in which case a second priming and the holding down of the carbureter float with the tickler is necessary to produce a sufficient number of explosions to warm the cylinders and air up to a point where the charge will ignite regularly.

Some builders of carbureters advertise their productions to work satisfactorily without the use of waterjacket or warmed air at the intake. This might have been possible when the higher grades of gasoline were obtainable. But the operator who endeavors to use 64 test without hot air or a warmed carbureter will find himself in a peck of trouble. Practically all builders of high grade cars provide for hot air at the intake, or a jacketed carbureter through which the hot water from the cylinders circulate. It has been my experience that with 64 gasoline that it is impossible to get too hot a supply of air from the exhaust pipes. Of course it would be unwise to cause the gasoline to boil in the carbureter. This would interfere materially with the mixture, making the carbureter action very irregular.

The carbureter should be so connected that it will work under uniform temperature regardless of atmospheric conditions. The inrushing air, picking up gasoline, is ever inclined to become colder than the surrounding atmosphere. Whenever a liquid is vaporized through carburetion the temperature of the mixture drops below that of either constituent. In short, we have in the carbureter a miniature ice-making machine. Large artificial ice plants alternately vaporize and liquify ammonia to produce a temperature sufficiently low to freeze water. Gasoline would probably serve this very same purpose in a way.

The reason the evaporation of a liquid lowers the temperature of the gas produced lies in the fact that in order to maintain a certain temperature, heat units in proportion to its volume must be present. Expand the volume, as when a vapor is produced, and we obtain one of two results—either enough heat must be furnished from an outside source to maintain this proportion, or the absence of such heat is shown by the lowest temperature. The greater the expansion, the colder the gas. Vice versa, compression crowds together more than the normal proportion of heat units and raises the temperature. This explains why air compressors are waterjacketed as completely as the internal combustion engine. The heat units that are pressed together beyond normal proportion in these cylinders seek to escape, and their egress, through the cylinder walls, would soon overheat the compressor if water were not circulating therein.

Naturally, therefore, the simplest way to produce a perfect and stable vapor or gas is to have convenient an abundance of heat to keep up the temperature. When weather is cold it is necessary to furnish even more than enough to bring the temperature of the carbureted mixture up to the temperature of the atmosphere. If the temperature of this gas becomes too low in the intake pipe it will for want of heat liquify to a greater or less extent. This condition will manifest itself to the operator whenever he attempts to accelerate the speed of the car. Instead of the motor immediately picking up at the opening of the throttle it will lose power, hesitate, stumble along and emit black smoke from the exhaust. This is caused by the increased flow of air through the throttle drawing a portion of the unvaporized gasoline into the cylinders, thus enriching the mixture to a point where it burns too slowly to give normal power.

Then, again, the carbureter should be kept at a uniform temperature in order that gasoline will flow regularly and freely from the nozzle. In its way, gasoline is affected by changes of temperature the same as heavy lubricating oils. Heat makes it thin, and causes it to flow past the needle point readily; cold congeals or thickens it, requiring further opening of the needle in order to permit the proper supply to flow out and enter the mixture.

A hot air pipe, connecting with a sleeve encircling the exhaust manifold, accomplishes the double purpose of furnishing the heat required to warm the gasoline in the nozzle of the carbureter and supplying the heat necessary to raise the temperature of the gas to a point where it will not condense in the induction pipe.

Theoretically it is bad practice to heat the mixture before it reaches the cylinder. The higher the temperature of the incoming gases the lighter the weight of the charge. In one early type of air-cooled motor it was found that the power was reduced to a marked degree through the overheating of the gases as they passed through the valve chamber and passage. In this model the incoming charge and exhaust gases passed through a common opening, an auxiliary sliding valve leading them to and from their respective channels. Naturally this particular spot became very hot, and the incoming charge absorbed so much of this heat that it was greatly expanded before it passed into the cylinder. This expansion acted on both sides of the valve and literally crowded out a large portion of the incoming charge.

In modern water-cooled as well as the more perfect air-cooled motors, however, the inlet and exhaust passages are separate. The temperature of the cylinder walls of the water-cooled motor has little chance to rise above the boiling point of water—212 deg. F. Such temperature would have little effect upon the weight of the charge. Inasmuch as the motors of the high-powered cars of today are throttled probably 95 per cent of the time, the heating of the air supply can have little effect upon average efficiency.

Experience has led me to believe that the hot air supply and character of intake pipe and valve timing are responsible for many of the shortcomings of the internal combustion motor that are laid to the carbureter. The construction of an intake pipe appears offhand to be a simple problem. But it is a fact that one of the most difficult problems in multiple-cylinder motor construction is to supply all the cylinders with a uniform quality and quantity of gas. The six-cylinder people in particular are having their own troubles along this line. The difficulty lies in the desirability if not necessity of using a single carbureter for a number of cylinders. Air is wonderfully elastic and appears to resent being battered about from pillar to post—from one cylinder to another. Take the T-shaped pipe, for instance, in the four-cylinder motor, the rule for firing is to start, say, at No. 1, jump to No. 3, next to No. 4, then return to No. 2. Now when the motor is running at, say, 1,200 revolutions and No. 1 draws in a charge the gas reaches a speed approximately of 60 miles an hour toward the front of the motor through the forward branch of the T. No. 3 follows and finds it necessary not only to start the gas at this rate in the opposite direction toward the rear of the motor but to overcome the impact of the gases going toward No. 1. By the time No. 3 has gotten the mixture well started in its direction its intake valve has closed, less than one-fortieth of a second having elapsed. Intake in cylinder No. 4 opens just in time to receive the gases accelerated by No. 3, and together with its natural suction is well filled. No. 2 then opens and meets with the same resistance from No. 4 that No. 3 met from No. 1. The result is both No. 2 and No. 3 are partially starved. Their explosions are weaker at high speed than those of the end cylinders. In order to get them to fire at all the carbureter is called upon to furnish a richer mixture than is necessary or advantageous for No. 1 and No. 4. This not only lowers the efficiency of the motor but causes it to consume more fuel than if all cylinders were supplied with a uniform charge. The engine balance is also affected by the lack of uniformity of power developed by the various cylinders.

This irregularity was more pronounced in earlier models when the Y intake was employed. There are a few manufacturers who have endeavored to overcome this unevenness through various devices and constructions, the description of which is somewhat out of the province of this department. But all are realizing more and more the necessity of uniformity in this direction. The warmer the carbureter's air supply and the more even the supply of gas to the various cylinders, the less trouble with fouled plugs and carbonized cylinders and piston heads. But this opens up an entirely new subject, which in justice to its importance and upon account of the space required for its discussion must be handled separately. In another issue of Motor Age I will go into this matter.

# FRENCH USING COAL TAR FOR MACADAMIZED ROADS

WASHINGTON, D. C., Dec. 1—Some time ago the impression got abroad that certain American motorists touring through France had been annoyed by the coal tar on certain roads adhering to the wheels and thereby being spattered over their car and the clothing of its occupants. This seemed to indicate that tarred roads have not, on the whole, proved successful in France. In reply to several inquiries on this subject from persons interested in road improvement in the United States, the following information has been obtained in France from authentic sources and forwarded to the Washington government: The treatment of macadamized roads with crude petroleum as a preventative of dust in summer and mud in winter was first attempted in southern France 10 or 15 years ago, and appears to have been successful for the suppression of the dust caused by ordinary traffic. But for obvious reasons the use of petroleum soon gave way to that of coal tar, which, as a by-product of gas manufacture, can be bought in nearly every district of France for from $10 to $12.50 per metric ton of 2,200 pounds. Coal tar has the additional advantage that, unlike oil, it hardens when exposed in a thin layer to the action of the air, covering the surface of the road with a practically air and water-tight skin, which not only holds down the dust in dry weather, but prevents water from penetrating the roadway in time of rain, provided the road itself is well constructed and the tar properly applied by workmen.

One of the first important experiments made by the French department of bridges and roads, was on the national route from Oran to Mers-el-Kebir, in the Algerian department of Oran. The test was made on a portion of the road leading from the city to a quarry, and over which the hauling of stone is heavy and constant throughout the year. The success of the system was fully demonstrated, and it has since been adopted and applied to many country roads and macadamized city streets throughout France. From evidence carefully collected and confirmed by the Touring Club of France, it appears that tarred roads have been uniformly successful wherever the conditions have been normal and the work properly and thoroughly performed. The following conditions are essential: That the road shall be solid, well built, properly drained, and free from subterranean infiltration of water. The surface of the roadway must be first swept, then washed free of dust, and allowed to remain undisturbed until completely dry.

The operation of tarring must be undertaken only in warm weather. The surface of the roadway then is spread with a coating of hot liquid coal tar, of such consistency as to be readily spread with a broom, so as to even up slight depressions and completely cover the surface. While the tar is still soft it should be strewn with a coat of clean sand or fine gravel and then left to cool and harden. Five or 6 days later a second coating of tar and sand should be applied in the same manner. The result is a roadway that is clean and durable. Roads so treated are hard and smooth, with a gritty surface, which gives good traction under all conditions of weather. The cleanliness and comfort of tarred roads is fully conceded in France, and the protection of the macadamized surface from wear and tear effects an economy which goes far toward balancing their additional cost. Just what use will be made of this information is not known, but it is believed that those interested in the good roads will find it valuable.

## ORIOLES WANT A SHOW

Baltimore, Md., Dec. 1—The Automobile Club of Maryland is anxious to have the next annual show held under its auspices, instead of by the dealers, whose efforts were so successful last year. With this idea in view committees, representing both the club and dealers, have been appointed to decide the question, and will hand in their decision at the next meeting of the club. When this question is settled, which will be in about a week or two, the preliminary arrangements for the event will be made. Members of the club think the proposed show should be held on a more elaborate scale than the last one, and that this can be done more successfully by the dealers and club members coöperating. The members contend it is customary all over the country for the clubs to hold the shows, and, consequently, they feel that the same privilege should be extended to the local organization by the Baltimore dealers.

# FOREIGN MOTOR STEEL PRODUCTS

**EDITOR'S NOTE—This is the first of an article on foreign motor steel products by Thomas J. Fay, of New York.**

JUST as the motor car was developed to its highest state of perfection on the continent, so was motor steel, and it is to the careful and painstaking German metallurgist to whom the world owes much for the high quality of motor steel now to be had in all lands, if not from one mill then surely from another, thus giving unto the motor car engineers a wide latitude and enabling them to turn out as good a car as their ingenuity can devise. If a motor car is inferior in these days it cannot be for want of good steel, so it must be on account of a faulty design or deliberate intent, following lack of knowledge on the one hand or a penny-wise policy on the other. Yet the claim has been advanced, and within the past few months, that good steel cannot be secured here. As a matter of fact this claim was advanced by one of America's foremost builders of high-grade motor cars.

During the pioneer days of the motor car—in America, at any rate—one of the main troubles was a positive lack of good steel and an equally positive lack of information on this most important subject. Illustrative of the inferior qualities of the steel used in American cars of but 2 or 3 years ago, the following test is offered, which test was made on a proof cut from a crankshaft of what was considered a good American car:

A 1904 CRANKSHAFT

CHEMICAL COMPOSITION—Carbon, 0.08; silicon, 0.021; sulphur, 0.048; phosphorus, 0.105; manganese, 0.51.

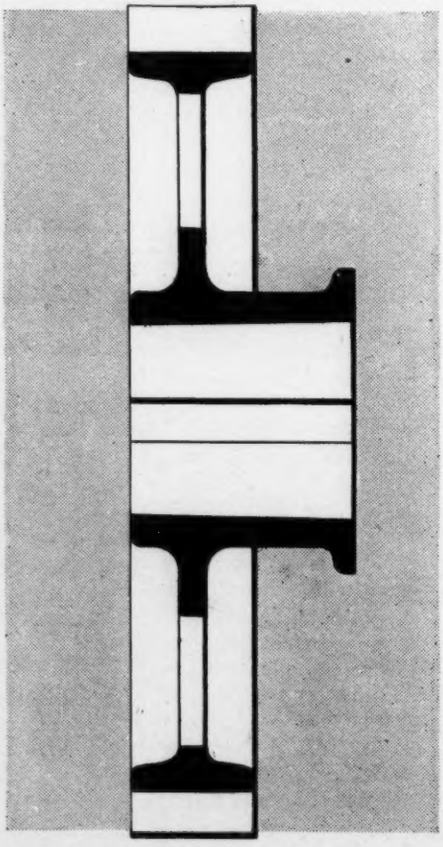
PHYSICAL PROPERTIES—T. S., 47,820; E. L., 22,112; Ex. 8", 25.2; Con., 67.5; structure, silky crystalline.

The test was made on a proof turned to ¾-inch from the finished diameter of the crankshaft, which was 2 inches. This product failed in service, just as might be expected, in view of its composition. The original order, however, specified 0.35 carbon acid open hearth steel, limiting phosphorus to 0.040, which, if delivered, would have served fairly well, in all probability, because then the strength would have been about as follows:

PHYSICAL PROPERTIES OF 0.35 CARBON A. O. H. STEEL—T. S., 80,000; E. L., 36,300; Ex. 8", 25.6; Con., 54.8; structure, silky. For the annealed product.

There was, then, a great difference as between the steel ordered and the steel actually found in the crankshaft, and it is this discrepancy that almost always did creep in to defeat the high aims of motor car constructors, even as short a while back as 1904. True, there were numerous instances where the steel received was superior to the steel ordered, but in such instances the chances were the use to which the steel was put demanded no better than the specifications called for. The point in relation to this matter is, the steel vendors consulted their stock in hand rather than the purchasers' specifications in very many instances, even to the extent of disregarding the fact that orders were oftentimes big enough to warrant running off special heats.

It soon came to pass that American motor car engineers commenced to wonder why, in a foreign car, a given part would serve perfectly while in an American car the same sized part, doing identical work, would deform. The writer, then chief of the designing department of a New York motor car factory, reached the conclusion that the colored man was in the steel mill,



DESIGN OF PANHARD GEAR TESTED

and by way of proof secured a gear and a valve from a Panhard car. The result was a complete revelation, and, too, it may be said, a great surprise, for the products secured tested as follows:

TEST OF A PANHARD GEAR

CHEMICAL COMPOSITION—Chromium, 0.71; nickel, 2.09; carbon, 0.36; silicon, 0.21; sulphur, 0.015; phosphorus, 0.013; manganese, 0.35.

The gear did not admit of a "pull" test, of course, and the writer communicated with Freid Krupp, A. G., Essen-Rohr, and was advised in due course that this material checked up with the Krupp brand E F 36-0 motor steel, which is about a second grade of the Krupp nickel chrome steel products for motor cars.

The valve taken from the Panhard car tested as follows:

Carbon, 1.14; silicon, 0.23; sulphur, 0.011; phosphorus, 0.008; manganese, 0.205.

This valve, like the gear, did not admit of a test by the pull method, and the writer had the composition duplicated with the result as follows:

T. S., 143,000; E. L., 70,100; Ex. 8", 2.8%; Con., 4.8%; structure, fine grain; diameter of test proof, 0.762 inches.

Here again the foreign car was a revelation, for instead of nickel steel for valves, as everyone supposed they should be, the Panhard valves were very high carbon and very low phosphorus steel.

In still another case, of an axle of a Mercedes car, the results of tests showed quite a different product from that supposed to be employed, a product so different and so very superior to even the finest carbon steel as to be beyond all belief. The test was as follows:

TEST OF A MERCEDES AXLE

CHEMICAL COMPOSITION—Chromium, 1.41; nickel, 3.31; carbon, 0.31; silicon, 0.26; sulphur, 0.028; phosphorus, 0.015; manganese, 0.41.

This axle did not admit of securing a proof for a pull test, but upon submitting the matter to the Krupp people it was ascertained that the product was of their brand known as E F 60-0.

The writer procured of this material a considerable consignment, with which to build a 30-horsepower touring car, and found the chemical composition about the same, with always low and closely regulated sulphur and phosphorus, which, to the trained metallurgist, signifies "good steel." The Krupp company guaranteed

for this steel physical properties as follows:

| T. S. | E. L. | EX. | CON. | CONDITION |
|---|---|---|---|---|
| 135,900 | 114,000 | 14% | 62% | Oil tempered |
| 110,000 | 95,000 | 16% | .... | Normal |
| 230,000 | 220,000 | 6% | 40% | Casehardened |

The lowest test on normal steel of this brand tested:

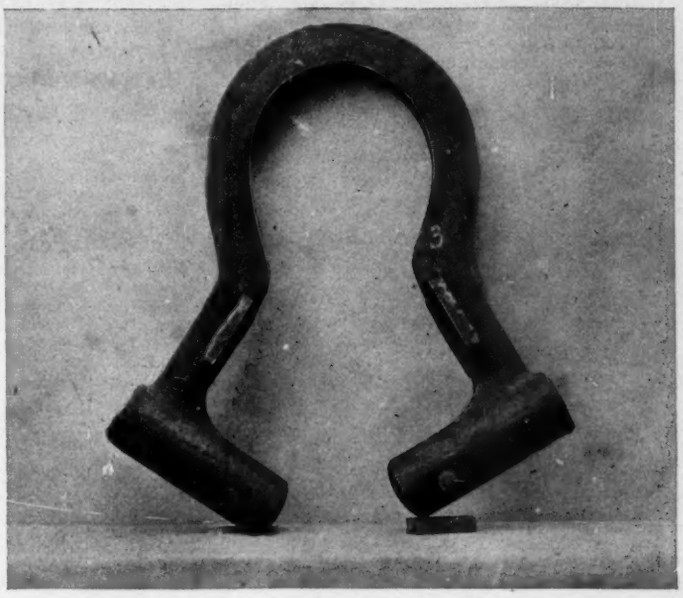
T. S., 109,100; E. L., 96,400; Ex. 2", 23%; Con., 61.8%; structure, fine.

This test shows a fine agreement excepting in the matter of elongation, which, instead of being 16 per cent, was 23 per cent, and, of course, such results were gratifying, for with an elongation of 23 per cent in 2 inches the steel could be worked as much as necessary without any chance of having the elongation drop below the desired point.

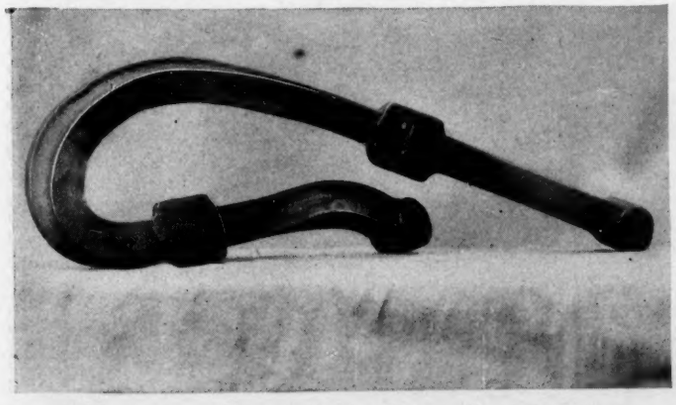
It was the aim of the writer to verify all claims of all steel-mongers with a view to finding the best steel to be had for motor car work, and at that time the question of nickel chrome steel was broached to the American mills, rather with the expectation of procuring steel at home as well as abroad. The American mills did not at first seem to be anxious to go into the matter of supplying what they termed freak steel, a name that seemed to fit the case, in view of the great difference in quality, but motor car engineers are not inclined to let foreign motor cars lord it over them for all time, hence the persistence with which this question was advocated. In time the American mills undertook the task and today nickel chrome steel may be had at home as well as from abroad. The question now is merely a question of quality and price, assuming deliveries can be made, and when it comes to a question of quality it is important to know what that article looks like in the dark as well as in the light.

Nickel chrome steel has its well-defined car-marks, by which it may be known, and because of its peculiarities it must be handled in a circumspect fashion and can only be produced if its quality is high in a manner consistent with its characteristics. In the first place, this product, to possess the desired virtue, must be low in both sulphur and phosphorus and, unfortunately, the process by which phosphorus and sulphur can be eliminated in the furnace does not produce the desired grade of steel. Metallurgists understand perfectly the fact that steel, by the acid process, does not in the slightest degree reduce phosphorus or sulphur; hence, steel, by the acid process, will have a higher percentage of both of these components in the finished product, than will be found in the raw product, of which the steel or "beat" is produced, because the quantity of the finished product is less than the quantity of the raw material used, by the amount lost in the process, thus accounting for an increase in the percentage of these components, since sulphur and phosphorus are not given off in the process. The only way, then, to account for the low value of the sulphur and phosphorus found in steel by the acid process is by assuming that raw material free, comparatively speaking, of these components is used in the process. It is an established fact that acid product is far superior to either basic or the bessemer product, and again it is concluded that steel from pure raw material is better than steel in which the process of its production eliminates sulphur and phosphorus. The differences between these processes may not be well understood by all who may be interested in steel, but it is too long a story to be interjected here and will be reserved for some other more opportune moment.

Just what constitutes the best steel from the motor steel point of view is a question of the utmost concern, because sulphur makes steel "hot-short" while phosphorus makes steel "cold-short." Steel high in phosphorus is treacherous and will not show up advantageously when subjected to the impact test, which test is absolutely the one of the most concern from the motor steel point of view, because, in motor cars, all parts must be made as light as possible and all parts are subjected to shock, to a greater or less degree; while some of the parts are subjected to enormous alternate shock stresses. Sulphur, if present in even a minute increment, renders steel unfit for forging into shapes for motor cars, in which the parts are small, intricate in shape, and likely to have to be reheated several times before they assume their final form. The first question to settle, then, is that of the sulphur and the phosphorus allowable in motor steel in general and that of the nickel chrome genus in particular. With a view to showing just how the land lays at the present time, and having in mind the fact that with nickel chrome steel, as with everything else, "all is not gold that glitters," some tests giving the values of sulphur and phosphorus are offered, after which deductions will be in order. Some of these tests are from Krupp product, more from other continental product, and the remaining tests of other grades of steel submitted from time to time:



E F 36-0 KRUPP NICKEL CHROME STEEL AXLE BENT UNDER DROP HAMMER—NO RUPTURE



AXLE OF E F 360 KRUPP NICKEL CHROME STEEL DEFORMED IN STOCK TEST—NO RUPTURE

TESTS OF NICKEL CHROME STEEL
CHEMICAL COMPOSITION

| Number | Chromium | Nickel | Carbon | Silicon | Sulphur | Phosphorus | Manganese |
|---|---|---|---|---|---|---|---|
| 1 | 1.40 | 3.31 | 0.31 | 0.26 | 0.028 | 0 013 | 0.41 |
| 2 | 0.71 | 2.09 | 0.36 | 0.21 | 0.015 | 0.013 | 0.35 |
| 3 | 1.90 | 3.31 | 0.227 | 0.15 | 0.033 | 0.30 | 0.34 |
| 4 | 1.53 | 4.40 | 0.256 | 0 244 | 0.012 | 0.013 | 0.73 |
| 5 | 1.69 | 4.26 | 0.204 | 0.211 | 0.006 | 0.017 | 0.35 |
| 6 | 1.87 | 3.38 | 0.238 | 0 183 | 0.026 | 0.025 | 0.35 |
| 7 | 1.64 | 4.21 | 0.32 | 0.106 | 0.037 | 0.010 | 0.40 |
| 8 | 0.63 | 2.19 | 0.38 | 0.19 | 0.042 | 0.025 | 0.16 |
| 9 | 1.50 | 3.51 | 0.28 | 0.24 | 0.013 | 0.012 | 0.39 |
| 10 | 1.46 | 3.44 | 0.29 | 0.28 | 0.014 | 0.011 | 0.42 |

These tests for chemical composition represent very nicely the ruling values for nickel chrome steel, and of them all the specimens Nos. 1, 2, 9 and 10 were Krupp, while Nos. 4 and 5 were of a comparatively high-priced special product. The remaining specimens were nondescript products. In view of the performance of the Krupp product and its wide use in several of the most satisfactory foreign cars, the writer reached what would seem to be a rational conclusion, namely, that the low phosphorus in the Krupp steel had much to do with the results attained, and adopted that phosphorus, or lower, as a

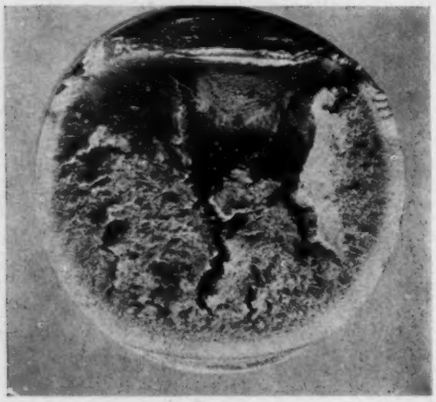
guide in the purchase of nickel chrome steel. It would seem as if all steel might be known by its phosphorus rating and might be valued about as follows:

PHOSPHORUS

0.010 to 0.013—Nickel chrome steel for axles, crankshafts, distance-rods, connecting-rods, differential-shafts, gears and other of the most important parts.

0.020 to 0.025—Nickel chrome steel for important parts of low-powered cars and unimportant parts of large, high-powered cars.

0.035 to 0.040—Nickel steel known as U. S. government standard, but of little use in motor



KRUPP E F 60-0—CASE HARDENED AND RUPTURED TO SHOW DEPTH OF ARMOR AND LONG FIBER OF CORE

car construction, but better by far than machine steel.

Under 0.06—The top limit for all structural steel, not holding nickel or chromium, but not good enough for motor car work, unless in side frames of light runabouts.

Under 0.08—Found in ordinary machine steel, for very unimportant work, but not good enough for any motor car work at all.

Under 0.10—Found in the very inferior grades of machine steel. Language fails to describe its inferior qualities.

To show just what might be considered a good grade of carbon steel, from the phosphorus point of view, the following test of an acid, open-hearth product used in some connecting rods is offered. It may be well to say, however, that the writer does not consider this steel good for modern connecting rods, which does not in any way reduce its qualities from the carbon steel point of view:

TEST OF ACID OPEN HEARTH CARBON STEEL

CHEMICAL COMPOSITION—Carbon, 0.28; silicon, 0.19; sulphur, 0.019; phosphorus, 0.023; manganese, 0.50.

PHYSICAL PROPERTIES—T. S., 85,000; E. L., 66,000; Ex. 2", 24%; Con., 64%; structure, silky.

This product drop forged perfectly and served its purpose, but for modern connecting rods the section would have to be too great, assuming the factor of safety to be adequate. This steel would answer for many purposes in which great strength is not required, as, for illustration, to take the places oftentimes taken by steel castings, and bronze castings as well. The carbon in this steel is too high for use in parts to be case-hardened, as ascertained by trying, which is a point worth something to know; but the same carbon in nickel chrome steel will not defeat case-hardening of that product, if the steel is low in sulphur and phosphorus.

As regards the allowable sulphur in steel, while it need not be so low as phosphorus, for equal quality, the fact remains it should be carefully limited, and if the sulphur is at all high the steel should not—a, be used for important forging work; b, in places required to sustain shock load; c, parts to be case-hardened; d, parts on which life depends, as knuckles, axles, steering gear parts or for drop forgings of any kind in a car.

The best classification the writer can think of at this moment would be as follows:

Under 0.015—In superior grades of nickel chrome steel for crankshaft, axles, knuckles, distance-rods and other important parts.

Under 0.030—Less desirable than the above but allowable provided phosphorus is below 0.015 in the most important parts as above.

Under 0.040—Too high for motor steel, either for forgings or for parts of any considerable responsibility at all if of nickel chrome steel. The limit for carbon steel for motor car parts of no great responsibility.

Under 0.06—The probable average for ordinary steel, in which sulphur component varies over broad ranges.

Illustrative of a carbon steel product marred by sulphur, the following is given:

CHEMICAL COMPOSITION—Carbon, 0.30; silicon, 0.212; sulphur, 0.059; phosphorus, 0.016; manganese, 0.039.

This steel was from spring hangers in an American car and, as might have been expected, the hangers showed surface cracks, probably developed in forging, due to high sulphur.

The following is the analysis of a carbon steel steering knuckle that shows up very much better from the sulphur point of view:

CHEMICAL COMPOSITION—Carbon, 0.23; silicon, 0.19; sulphur, 0.036; phosphorus, 0.020; manganese, 0.62.

This product is a little high in manganese to make up, no doubt, for the carbon deficiency, but the sulphur component is fairly low, considering the grade of steel it was sold to represent. The phosphorus is normal, since the steel is all acid, open-hearth product, with a phosphorus of 0.03 in the specifications.

As a very fine grade of acid, open-hearth steel the following is offered:

CHEMICAL COMPOSITION—Carbon, 0.28; silicon, 0.234; sulphur, 0.021; phosphorus, 0.012; manganese, 0.52.

This product was used in the manufacture of drop forged spring links, and for carbon steel represents as good a product as one might expect to obtain. Having thus illustrated the possibilities in the way of procuring steel, it may be in order to further illustrate the ills of high sulphur and phosphorus when nickel chrome steel is involved in the operation, as follows:

TEST OF INFERIOR NICKEL CHROME STEEL—T. S., 136,300; E. L., 81,200; Ex. 8", 10.1%; Con., 50%; structure, crystalline; diameter of test proof is 0.767 inches.

The chemical composition of this metal must be looked to to explain away its very unsatisfactory physical characteristics. The chemical composition was found to be as follows:

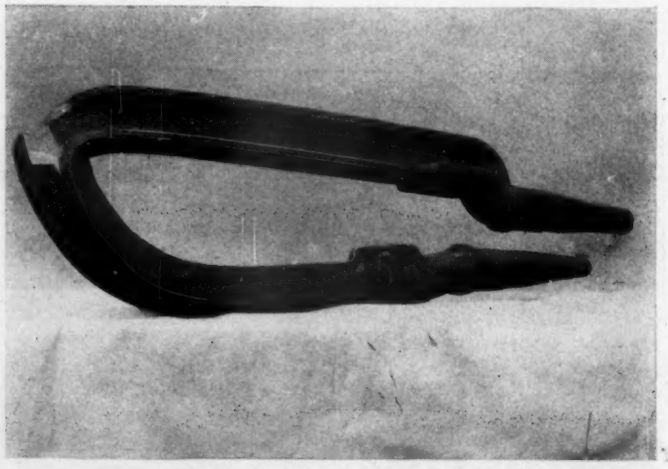
CHEMICAL COMPOSITION—Chromium, 1.86; nickel, 3.32; carbon, 0.214; silicon, 0.192; sulphur, 0.032; phosphorus, 0.029; manganese, 0.39.

It seems from all evidence obtainable in the regular way that steel, as high as this product in sulphur and phosphorus, is not likely to possess a desirable elongation. It would also appear as if this steel was doctored by the mill, with a view to bringing up the tensile strength to have a talking point, presumably on the assumption that motor car engineers are not skilled enough to know that a high tensile strength is really of no value at all if it is attained at the expense of elastic limit and elongation. The reason the writer thinks this steel was doctored is because it looked as if it was quenched, and in talking to the maker's representative about it, that individual made a big point of the tensile strength, enlarged upon their secret method of treatment, and suddenly remembered he had an appointment to keep when the writer referred to an unusual discrepancy in the figures. As a matter of fact, steel such as the last specimen referred to, even though it is nickel chrome steel, would not be anywhere as good as a fine grade of carbon steel costing one-eighth the price. Take, for illustration, carbon steel of the acid, open-hearth genus, quenched and annealed, the results might easily be as good as the above nickel chrome steel, as the following test will testify:

CHEMICAL COMPOSITION—Carbon, 0.45; silicon, 0.025; sulphur, 0.019; phosphorus, 0.027; manganese, 0.45.

PHYSICAL PROPERTIES—T. S., 150,000; E. L., 90,000; Ex., 10%; Con., 54%; structure, close.

Water quenched at 835 degrees Centigrade and subsequently annealed to 570 degrees Centigrade. This steel has the same elongation as the inferior nickel chrome steel, a greater tensile strength and elongation, and, on the impact test,

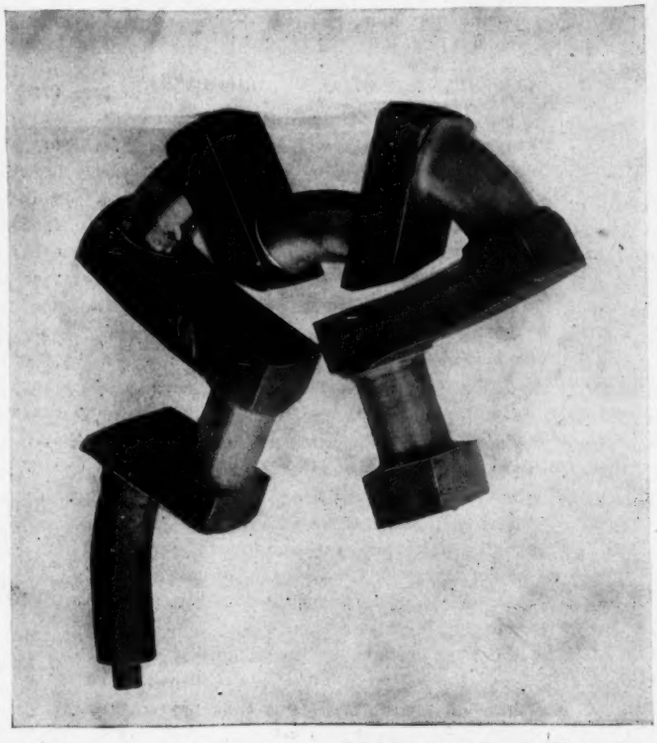


KRUPP E F 60-0 BENT BY 600-KILOGRAM HAMMER FALLING DISTANCE OF 5 METERS

stood up very well, whereas the high-priced alloy steel was not a good impact steel at all. The point the writer wishes to make in thus pointedly bringing up these comparisons is to pay a high price for inferior nickel chrome steel is to hit the atmosphere a far distance from the target, since a fine carbon steel would serve better, would cost less money by far, and would be much easier to machine in every way. This is not to say a car of fine carbon steel will compare favorably with a car of fine nickel chrome steel, because tests and experience do not justify any such conclusion. Up to the present the writer has not developed the exact reasons why nickel chrome steel is especially valuable for motor car work, nor can any set of tests, such as are ordinarily made, develop any of the real reasons. In the first place no pull test will show the ability of steel to withstand shock, nor will pull tests show up the ill effects of either sulphur or phosphorus. If this is so, the usual methods of proceeding tend to engender a false sense of security not justified by the facts; and but a moment's thought will lead to a single conclusion, namely: Steel makers have always advanced their arguments of quality based solely on tensile tests, and it is but rarely any of them ever deigned to guarantee impact results. True, steel for ordinary purposes may not have to withstand impact, but in motor cars steel must, to be suitable, be of the kind that will withstand impact, and the Krupps, recognizing this fact, developed a line of motor steel in which the ability to withstand impact is its marked and conspicuous feature.

It is not the question here as to whether or not other companies have done likewise, for they may have done so, or perhaps they do not care to cater to trade requiring such grades of steel. The Krupp company claims to have developed a line of motor steel holding these desirable properties, and the purpose of these articles is to discuss the merits of the claims so advanced. The remaining object is to show how desirable it really is to employ steel capable of sustaining shock loads. In justice to the trade in general, the writer wishes to say he has examined and used other than Krupp steel that was suitable for motor car work, and would withstand shock loads, among which some crankshafts of Bishoff motor steel may be mentioned as having been a good success. This steel was referred to as No. 4 in the chemical comparison of nickel chrome steel products, and can only be criticised on the score of cost, which is very high, indeed.

In the manufacture of nickel chrome steel, or any other of the alloy steel products, advantage is taken of the marked characteristics given to carbon steel by the addition of chromium and nickel, for the one product or vanadium, titanium tungsten, boron, uranium, and other elements, also, nickel alone to make nickel steel. The question of the relative virtues of the various genera of alloy steel must be settled in the future, for in all truth the whole question is new. In armor plate work, and for projectiles, the question of impact properties of steel naturally arises and in the production of armor plate and projectiles the rarer metals were introduced, although tool steel was more responsible for the many discoveries made than the armor plate and projectiles. Tool steel, for illustration, runs high in tungsten considering some of the finer grades. Take for instance the well known mushet steel; the composition is given as follows:



KRUPP EF 60-0 CHROME NICKEL STEEL CRANKSHAFT—WHAT IT STOOD UNDER A HEAVY HAMMER TEST

Chemical composition: Tungsten, 7.17; carbon, 2.15; silicon, 1.32; sulphur, 0.019; phosphorus, 0.010; manganese, 2.14.

Or, to show a further development of the tool steel series, reference may be had to another tool steel, as follows:

Chemical composition: Tungsten, 13.5; molybdenum, 1.12; carbon, 0.65; silicon, 0.22; sulphur, 0.104; phosphorus, 0.012; manganese, 0.140.

And still another:

Chemical composition: Tungsten, 13.5; chromium, 3.5; carbon, 0.50; silicon, 0.20; sulphur, 0.011; phosphorus, 0.014; manganese, 0.18.

Both of these products, in the annealed state, have valuable properties in structural work, even though they properly belong to the tool steel genera, for in spite of their characteristics the elongation, in both cases, is above 13 per cent in 2 inches; but, heat treatment cuts the elongation down very rapidly, and it was with a view to correcting this evil that the proper alloy steel for motor cars was developed. It also is noteworthy that tool steel may not be relied upon enough to withstand impact, hence this important matter received its quota of attention simultaneously. Nevertheless, the original product is substantially the same for both tool steel and motor steel, thus accounting for the low sulphur and phosphorus in both cases.

While a certain amount of the proper grade of scrap can be utilized in the production of these fine grades of steel, yet, even so, reliance must be put upon a source of nearly pure iron in the main. The process may be crucible or acid, open hearth, but no whit of injurious ingredients may be taken out in the process. So to get good results good materials must be used. A good grade of cement bars for this purpose would be as follows:

Chemical Composition: Carbon, 0.050; silicon, 0.035; sulphur, 0.008; phosphorus, 0.010; manganese, 0.120; copper, trace; arsenic, 0.004.

The carbon in this metal is low enough to allow of the increase likely to come in the process. The sulphur would stand the increase likely to follow the process; the phosphorus would go up a little, due to scrap and process; manganese would increase, and copper and arsenic, in so far as may be known, are not wanted at all, but are low enough as not to deserve comment. As may be suspected, the world's supply of such fine iron is limited, and it is due to the definite control of numerous mines in Spain and the north of Europe that enables the Krupp company to furnish a uniform grade of steel for motor car work, such as will make for itself a record, with no chance of the supply of raw material running out for years. These cement bars are not in themselves strong enough for motor car work, since the tensile strength of such iron might not exceed 40,000 pounds per square inch, but this material, up to its limits, withstands shock loads far better than higher sulphur and phosphorus mild steel, whereas adding carbon to steel, while increasing tensile strength, does not reduce sulphur and phosphorus.

Having in hand the desired raw material, it is not impossible to see how the good properties of carbon, nickel and chromium may be imparted to the steel. It is an understood fact that iron alloys with most metals, hence the name alloy steel if we consider the difference between iron and steel a mere matter of carbon, the latter being present in alloy steel, in about the same proportion as in ordinary steel.

# THE READERS' CLEARING HOUSE

## BOTHERED BY BINDING CHAIN

La Salle, Ill.—Editor Motor Age—In your November 22 issue, in the Readers' Clearing House, is a query concerning binding chains. The answer does not clear up the subject to the writer, who has had similar trouble. Having worn out two very satisfactory chains which were discarded only after several rollers had broken, a new chain was ordered put on, the change in make being due to alleged impossibility of getting the former make in time. The new chain caused trouble from binding from the start, and it took at least 500 miles of unsatisfactory performance to get things in fairly good running order. In this case the new chain was in perfect condition as to lubrication, having been boiled in Dixon graphite compound before using. Either the chain, which was supposed to be of same size as the old one in every particular, did not fit the sprocket it was intended for, or the sprocket had worn to the old chain, and had to be reworn to fit the new. I never was able to find out the exact trouble. At all events there was no doubt but what the terrific grinding sound was on account of the new chain, but it was never heard until the clutch was thrown in. The engine power was greatly reduced, and for weeks the car refused to run at more than half its usual speed. Similar trouble was not experienced when the second chain was put on, the troublesome one being the third. To the eye the sprockets do not show excessive wear and one is comparatively new.—V. A. M.

## MATTER FOR THE MAKER

Montgomery, Ala.—Editor Motor Age—I will appreciate it if you will answer the following through the columns of the Readers' Clearing House: I own a model E Queen car, built by the C. H. Blomstrom Motor Co., of Detroit, Mich. The transmission on this car is separated from the crankshaft and is attached by three bolts through a hub 5 inches in diameter. The shaft at the hub has 1¼-inch diameter. Inside of 6 months I have broken three of these shafts and each time the motor had a steady pull on the low gear. The motor is double opposed, 5 by 5-inch, and the car weighs 1,650 pounds. Can you tell me the cause of these shafts breaking? Are the shafts too light or is the material defective, and is there a remedy to keep them from breaking?—C. F. C.

Strictly speaking, this is a case for the maker of the car. He will know from experience with this model whether the trouble caused is occasioned through poor material, poor design or from some cause foreign to his knowledge in this particular case. It is possible something is badly out of line or that there is a lack of lubrication. At any rate, the statement of the trouble is too abbreviated to warrant an opinion from anybody but the maker, and it is doubtful if, from the statement given, he will be able to suggest a remedy unless this proposition has been presented to him before. If after writing the maker and receiving no satisfactory answer, the inquirer will make a sketch of the parts and then send the same to Motor Age, together with a more detailed statement of the general condition of the car and its parts, an attempt will be made to solve the problem. As it is there is little to work on and the patient a thousand miles away from the doctor. There are some mail-order doctors that advertise to cure anything, but Motor Age is not one of them and does not make any pretense along those lines.

## GASOLINE VAPOR

Dayton, O.—Editor Motor Age—To settle an argument, will you please state through the columns of the Readers' Clearing House whether the vapor from gasoline rises or descends? I have maintained that should a small quantity of gasoline be sprinkled on the floor of a room the vapor therefrom would settle on the floor rather than rise and be in danger of igniting from lighted gas jets.—J. E. W.

Temperature would have much to do with the case. A closed room might be warm enough to permit the vapor to rise to a point of danger of igniting from the gas jets. Likewise, the quantity of the gasoline poured out would become a factor, as the more gasoline poured out the more vapor it would give off. But the vapor is heavier than air and the tendency is to settle rather than rise. If a quantity of gasoline were to be spilled and it were desired to air the room, the vapor would pass out of an open door nearer the floor than nearer the ceiling. But don't do any experimenting along these lines, for gasoline while perfectly safe under most circumstances becomes rather dangerous and uncontrollable under others. It is well to keep a garage or other place where gasoline is kept, no matter how well confined or how carefully guarded, well ventilated at all times. An ounce of prevention is worth a pound of cure, as experienced motorists have found out.

## HAS ROTARY MOTOR

West Plains, Mo.—Editor Motor Age—In looking over the November 8 issue of Motor Age I find that the opinions of readers are asked on the subject of track racing. I beg to say my opinion on this subject coincides with that heretofore published in Motor Age. Permit me to say also that I have been running a 40-horsepower car fitted with a new resilient steel wheel over the roads to the Ozark mountains for the past 6 months and there is no perceptible wear to the tires. These wheels are practically noiseless while running on any sort of road and they have the further advantage of costing two-thirds what ordinary rubber-tired wheels cost; at the same time they will last five times as long in actual service. I am also working on a gasoline rotary motor which I shall soon install in my car and unless my expectations fail I will be able to travel 150 miles an hour if the roads will permit such speed.—J. A. R. A.

## REMEDY FOR BINDING CHAINS

Oil City, Pa.—Editor Motor Age—In the November 22 issue of Motor Age George Gearhart, of Pittsburg, asks about binding chains. I beg to say I have had similar experiences with chains and after wasting a lot of time and tissue discovered by actual test that the chains had stretched enough to make each link too long to fit the sprocket seat and persisted in riding the sprocket teeth. I gave up and put on new chains and had no further trouble. I do not believe there is any other way out of such a trouble, and advise anybody having it to put on new chains at once. A chain that has seen service for 3 years has earned its cost and performed its allotted service and should be replaced by the owner. A master mechanic will tell you that a badly stretched chain cannot be made to do satisfactory work.—Dealer.

## EFFICIENCY OF PICRIC ACID

Pittsburg, Pa.—Editor Motor Age—Kindly state through the columns of the Readers' Clearing House if picric acid added to gasoline gives increase in power in a gasoline motor. Some owners tell me it gives even as high as 15 per cent more power than clear gasoline; others claim it is of no value. Is there any prepared mixture on the market that will increase the power of a gasoline motor?—Lawrence Schley.

Gasoline will absorb about 5 per cent of its weight of picric acid, and by adding a little kerosene to the fuel it will absorb nearly 10 per cent. Picric acid will give from 15 to 20 per cent more power, according to good authorities. It has been charged against one prominent European house which won a number of contests during the past year that it used picric acid to increase motor power. A pound of picric acid is used for each 3½ gallons of gasoline. The mixture is allowed to stand for a couple of days, being agitated at times. It is then strained. As a matter of fact, the use of picric acid should be discouraged. Write the Energine Co., Cleveland, O., about a prepared fuel for internal combustion motors if you desire any more information along this line.

# FROM THE FOUR WINDS

**Straw on Roads**—Twenty-five miles of roads leading to Krupp, Wash., west of Spokane, have been covered with straw, thus giving Douglas county the best roads leading to the Great Northern railway. There is a movement on foot to have the roads covered with rock.

**Her First Ride**—Mrs. Susan Askey, 101 years old, of Baltimore, Md., went to church in a motor car on her birthday Sunday. Despite her advanced age and the fact that she is blind, Mrs. Askey enjoyed the ride immensely. She said that she considered the motor car, as a means of conveyance, far superior to the horse and buggy.

**Up Steptoe Butte**—Noteworthy was the climb to the summit of Steptoe butte, Whitman county, south of Spokane, of a car containing Horace White and family, of New York city. With Clarence Brown at the wheel, Arthur Jones' 12-horsepower Franklin rolled up the stiff grade in easy style. It is said to be the first large touring car that has been able to make the ascent of the famous landmark of the Palouse region.

**Boulevard Company**—The Spokane Boulevard Co., of Spokane, Wash., has just been incorporated with a capital of $300,000, the trustees being W. H. Cowles, F. W. Gilbert, L. P. Hornberger, C. I. Pugh and H. M. Stephens. The company purposes grading, macadamizing and improving streets and boulevards and to maintain parks. It will also assist in a movement for good roads throughout eastern Washington, the object being to encourage motoring.

**Compound's Fuel Consumption**—The record made by the Compound "Plugger," driven by D. F. Graham in the economy test of the New York Motor Club, shows that Graham used 8 gallons of gasoline the first day on the run to Albany, 10 gallons on the second day through the Berkshire hills blizzard to Springfield and 9 on the last day's run back to New York. His odometer showed 444 miles traveled in all. Making the entire distance on 27 gallons of gasoline, Graham had an average of about 16½ miles to the gallon.

**Ross Will Not Race**—While in Boston recently Senator Morgan, after Ormond entries, sought out Louis Ross, who 2 years ago, with the "tea kettle" swept everything before him at the beach, but Ross told him he probably would not be a competitor this time as he is too busy. Stanley is said to have made a proposition to Ross to go to Ormond this year and agreed to stay at home, but Ross told him it was up to him to try and get back the laurels he lost to the Darracq. So Stanley probably will go down with one of the cars he built for the Vanderbilt race. Whether Marriott will do the driving this time for Stanley is not known. He has just returned from Europe and recently he got married, so he may object to risking his life driving racing cars.

**December Show Poster**—Fal, a French artist, designed the poster in seven colors for the American Motor Car Manufacturers' Association, which is being used in bringing the attention of the public to the cars made by its thirty-nine members. It is an allegorical design, showing "Miss Columbia at the wheel."

**Government Garage**—At a conference held recently it was decided that the government would establish in New York a garage for the examination and appraisal of imported motor cars. Several buildings were reported as available, and it is probable that the car barn of the New York City Railway company, on Christopher street, may be selected.

**To Educate Road Builders**—Lillis F. Smith, wheat king and financier, of Endicott, Wash., south of Spokane, is advocating a special course at good roads building as part of the curriculum at the Washington state college at Pullman. His plan is to have young men taught the practical part of road building by competent instructors. He believes that students qualified in this work can easily earn from $5 to $6 a day supervising the building of roads in this part of the country.

**Another 100-Hour Test**—The 100-hour, non-engine stop run of the Oldsmobile four-cylinder touring car, successfully finished last week in Cleveland, attracted a widespread attention among dealers and drivers in that city. In 100 hours the car covered about 1,450 miles without stop. It was kept on the busy downtown streets and the task of keeping it moving all the time was a severe one for the drivers, R. R. Owen and C. Levy. The test was especially interesting because it was made in very inclement weather and over city pavements.

**Coast Enterprise**—Good roads advocates will ask the next legislature of Washington to change the laws so as to extend the authority of county commissioners and prevent injury to existing roads. It is also likely that legislation will be asked regulating the running of motor cars on macadam roads, but this will not be pressed by the good roads organization. After an investigation in eastern states, Samuel Hill, president of the Washington Good Roads Association, believes regulations should be provided to compel drivers to keep to the right and avoid cutting ruts in the center of the road. The rapid flight of motor cars has been found to cut up the highways as much as a narrow-tired and heavily-loaded wagon, but it is possible this danger might be minimized if all parts of the road were used to the same extent. At present most drivers stick to the center of the road unless compelled to turn out for vehicles, which results in injury to the highway.

**Mabley in Mud Plug**—To try out the 1907 30-horsepower S & M Simplex, C. R. Mabley and a party of friends recently drove from New York to Washington, D. C., with Al Poole at the wheel. They covered the 312 miles in 17 hours 30 minutes, but fought mud all the way. "We encountered a number of motorists stuck in the mud, one of whom was enjoying the assistance of two mule teams," said Mr. Mabley. "Again and again we were warned that we would not be able to get through, and I feared that this would be true, considering that as I stood on the step of the car, ready to jump at a moment's notice, my feet were constantly being pushed off the running board by the mud which closed over it."

**Australian Assemblers**—The carriage manufacturers of Adelaide, South Australia, are adding another line to their industry, which has already proved a profitable departure and bids fair to develop into a paying permanent business. They are importing parts of motor cars from France, manufacturing the body in their shops, with the necessary upholstering, etc., and placing the finished car on the market as the product of their own factories. No deception on the public is practiced, but, like the building of Australian carriages, from the output of American factories, it is another phase of the development of Australian industries encouraged by the consumer, and consequently profitable to those engaged in the business.

**Cleveland Stirred Up**—The Cleveland Automobile Club has decided to take active steps to improve road conditions in Ohio. One of the first steps will be to build a short stretch of road following the ideas that have been carried out in Massachusetts in order to demonstrate to the legislature what a good roads really should be. The club voted the sum of $500 for the preliminary work and to prepare plans for the new stretch of road. The road itself will be built by funds subscribed by enthusiasts, and if possible the county will be induced to assist. It is probable the road will be macadamized. The club will take particular care to see that it is well drained and has a good foundation. Brick, stone or gravel will be added for top dressing, but just which has not been decided. The club committee on good roads will coöperate with the Ohio Good Roads Association, the state grange and such other organizations as are interested in better roads.

# AMONG THE MAKERS AND DEALERS

**Cartercar in New York**—The Cartercar Co. has opened a New York branch at 1697 Broadway.

**Bay State Line**—A project is on foot to establish a motor car service between the Boston and Maine depot and the Mount Toby house, in Sunderland, Mass.

**Publicity Man for Autocar**—H. A. Gillis, general manager of the Autocar Co., of Ardmore, Pa., has established a publicity department. The work will be directed by C. H. Rockwell, who was formerly with the Haynes Automobile Co.

**Dragon's Quaker Branch**—The Dragon Automobile Co. will establish a Boston branch at 117 Massachusetts avenue, where D. S. Corlew, vice-president and sales manager of that company, will have his headquarters. He will be assisted there by W. S. Daniels, late of Grand Rapids.

**Jersey Enterprise**—The Union and Middlesex Transportation Co., of South Plainfield, N. J., has just been organized with a capital stock of $15,000, and will operate a motor car passenger line between South Plainfield, Metuchen and Plainfield. Trailers will be added to the passenger cars and freight and mail will be carried.

**Is Rainier's Boston Man**—John R. Buck, who has for years been chief auditor of the White company, has resigned his position and has formed a company to locate in Boston and to handle the Rainier exclusively. The concern will be a $200,000 corporation and will put up a large building, to be used as a show room and garage in Boston. The agency for the Rainier for Mexico has been placed with H. T. Braschi, of Mexico City.

**Buys Tire Repair Plant**—The Chase Motor Truck Co., of Syracuse, N. Y., has purchased the entire tire repair outfit of the Syracuse branch of the Fisk Rubber Co. This plant consists of vulcanizing heaters and molds for every size and make of tire and a complete outfit for recovering tires. The company will install the apparatus on the third floor of its retail sales building, where it will run the tire business as a department of that branch of its business.

**Coast Enterprise**—The Pacific Coast Automobile Co., of Seattle, Wash., has broken ground for a garage at 1414 Broadway. The foundation is for a six-story building, two stories and basement, which will be completed this year. The first floor is to be reinforced concrete, making it absolutely fireproof. On the first floor will be located the offices and a retiring room for women. There will also be a room for men, with lockers. The repair shop will be on the second floor. The company is capitalized at $25,000. E. P. Gaffney is president; V. V. Bigelow, vice-president, and George B. Lamping, secretary and treasurer. The company has the agency for the Pope-Toledo, Thomas Flyer, Detroit Thomas, Oldsmobile, Buick, Pope, Waverley electric and a commercial line.

**Dragon in Chicago**—The Branstetter Motor Co., 1337 Michigan avenue, Chicago, which formerly handled the Queen, has taken on the Dragon agency for Chicago and vicinity.

**Franklin's Aluminum Consumption**—The H. H. Franklin company claims it is using approximately 175,000 pounds of aluminum a year, of which 75,000 pounds is in specially rolled sheets and the rest in the form of engine bases, transmission cases and other simliar castings.

**Plans Big Bus Service**—William A. Gray, assistant district attorney, of Philadelphia, has leased the Pellevue-Stratford garage for a term of years, and in conjunction with several prominent financiers, intends to operate a motor car service to replace the present cab service. He has already made contracts for about forty cars of different styles.

**Quitting Horses**—J. M. Walkins, manager of the Pacific Transfer Co., of Spokane, Wash., is negotiating with eastern concerns for the purchase of $25,000 worth of vehicles for delivery purposes in Spokane. A sample machine is now in transit, and if satisfactory ten others will be added in 60 days. "We figure that one car with an expert to operate it and a boy assistant along to do the jumping can be made to do the work of two or three ordinary delivery wagons drawn by a single horse," said Walkins.

**Latest in Cleveland**—The new garage and salesroom of the Metropolitan Motor Car Co., Cleveland, will be completed about December 15. The building is located on Nineteenth street, just off of Euclid avenue. It contains 40,000 feet of floor space and is said to be the largest garage building in the country, except one in Boston. W. C. Anderson and J. Theodore Tethem are at the head of the company. J. H. Kirkpatrick, formerly in the mechanical department of the Standard Automobile Co., has taken the position as superintendent of the company's shop.

**Stearns Agency List**—The F. B. Stearns Co., of Cleveland, has completed its agency list for 1907 and announces it as follows: Wyckoff, Church & Partridge, Broadway and Fifty-sixth street, New York; A. E. Morrison Co., Boston, Mass.; Motor Shop, 317 North Broad street, Philadelphia; Fort Pitt Automobile Co., Euclid avenue and Baum street, Pittsburg; Scottdale Automobile Co., Scottdale, Pa.; United States Automobile Co., Rochester, N. Y.; Hughes Automobile Co., 608 Broadway, Cincinnati; Reyburn Motor Car Co., 5023 Delmar boulevard, St. Louis; Capital City Automobile Co., Atlanta, Ga.; Githens Brothers Co., 1328 Michigan avenue, Chicago; Automobile Co., 365 Fell street, San Francisco, Cal.; R. H. Mahlke, Wheeling, W. Va.

**Leahy Advanced**—Edward W. Leahy, of Albany, N. Y., has been elected superintendent of the Albany Garage Co., of Albany. Mr. Leahy has been connected with the company since its incorporation and was the third motor car owner in the city of Albany.

**Apperson Man in New York**—W. F. Hays has recently become the sole manager for the Apperson product in New York. The new sales rooms at 1665 Broadway, corner Fifty-second street, are being redecorated and fitted for the reception of the new cars.

**Washington Transfer**—Holly T. Acre has given a bill of sale to Charles J. Peckham of all interest in the Capitol Hill Garage Co., of Washington, D. C. Peckham has in turn given a bill of sale of same to James J. Flynn. The consideration in each case was the nominal sum of $10.

**Northwest Enterprise**—The launch and engine works of Peter Steffes, at Winona, Minn., are to be enlarged to provide for a motor car repair and machine shop. No attempt will be made to manufacture motor cars, but the works will be equipped to care for every kind of repair and rebuilding work for the surrounding country.

**Another Job for Tracy**—In addition to his research work for the Locomobile company and others, Joseph Tracy will give his advice and the results of his experience to the Dragon Automobile Co. To that end he is at present in Detroit, where he is going thoroughly into the design and workmanship of the demonstrating cars now being built.

**Spargo Improving Plant**—The Motor Car Co., of Minneapolis, J. S. Spargo manager, is putting up a new two-story fireproof building on Tenth street, between Fifth and Sixth avenues, south. The building will be in mission style, with a floor area 50 by 90 feet. The ground floor will be for garage and salesrooms, and the garage will be unobstructed by posts or other supports. Shops and storage will occupy the second floor. The company will continue the Jackson and Welch lines in Minneapolis.

**Matheson Changes**—Owing to the change that has taken place in consequence of the recent death of Tom Cooper, it is the intention of the Matheson company to have Ralph Mongini, the driver for the Matheson in the Vanderbilt, act as head demonstrator and salesman in New York. Harold E. Callisen has recently been made the assistant secretary of the Matheson company, New York. and Frank Lescauld has been engaged as expert and mechanical adviser. Hereafter the Albany Garage Co., Albany, N. Y., will handle the agen-

cies for this product in Albany, Rensselaer, Montgomery and other counties as far as Newburgh.

**Opens Model Garage**—The Atlas Motor Co., of New York, has opened a model garage at 102-106 West One Hundred and Seventh street. The building covers an area 75 by 100 feet.

**Ansley a Franklin Agent**—F. W. Ansley has been selected as the representative for New York and New England. Mr. Ansley was for some time connected with the Franklin company's sales department.

**Change of Management**—The Kenwood garage, at 5031-35 Cottage Grove avenue, Chicago, is now known as the Washington Automobile Station, with F. E. Dodge in control. The floor space is nearly 20,000 square feet, well lighted on three sides and with a cement floor. The company also makes a specialty of converting rear entrance tonneaux into side entrance bodies.

**Increases Stock.**—The Rainier Co. of New York announces that the capital stock of the company has been increased to $500,000, a step found necessary on account of the growth of the business, the opening of a new garage in New York city and to facilitate the manufacture of its product. The management and board of directors will remain as before—J. T. Rainier president and treasurer, and Mr. Linsberger vice-president and general manager.

**Transfer of Interests**—The Sterk Mfg. Co., 69-71 Wells street, Chicago, has been succeeded by the Stewart & Clark Mfg. Co., which has purchased the assets, good will and patents and which will continue the manufacture of the long distance siren, and which will also put on the market the Stewart speedometer. The business will be continued at the Wells street place until January 1, when the company expects to move into its new shop at 502-4 Diversey boulevard, where it is putting up its own building.

**Dragon in New York**—The agency for New York and Brooklyn, including Long Island, Westchester and Staten Island, for Dragon cars, has been awarded to Bishop, McCormick & Bishop, who at present conduct the Majestic garage at Halsey street, near Bedford avenue, Brooklyn. In connection with this announcement it was stated that F. G. Carrie, formerly of the Haynes company, has been appointed sales manager by the new agents, and that salesrooms have been secured at 1677 Broadway, near Fifty-second street. No garage will be maintained in New York city, the Majestic garage in Brooklyn being used for the storage for cars in bulk while demonstrating cars will be kept in some established garage in Manhattan. The work of preparing the new show rooms in the Hotel Lincoln, which are 25 by 75 feet, will be pushed vigorously, and it is expected that they will be opened early this month. The firm of Bishop, McCormick & Bishop is a new one, succeeding the firm of Bishop & Son, which handled Maxwell cars and several other well-known products in Brooklyn last year.

**D. J. Hayden Changes**—D. J. Hayden, formerly sales manager of the Marion Motor Car Co., has accepted the management of the Griffen Motor Co., of Fort Wayne, Ind.

**Trade in Toledo**—Contracts for the handling of fifteen lines for the coming season have already been signed by the agencies at Toledo, O. Most of the Toledo dealers have cut their lines down. Some will confine their efforts to the sale of one line exclusively, others to two or three, but it is hardly probable that any agency will go it as strong as last season—that is, handling a half-dozen lines or more. The Atwood Automobile Co., which was organized less than a year ago and which opened a large garage, has signed contracts for the handling of the Franklin and Waverley lines. A. A. Atwood, the head of the concern, stated that he did $60,000 worth of business in Waverley electrics since the garage was opened last spring, and that he is doing a nice business in Waverley trucks. The Central Automobile & Garage Co. will handle the Auburn and Mitchell, the Lichtie Automobile Co. the Cadillac, the Kirk Brothers Automobile Co. the Buick and Thomas, the Weed Garage the Ford, Stoddard-Dayton and Columbus, while the Toledo Motor Car Co. will devote its efforts to selling the Winton and Pope-Toledo gasoline cars and the Columbia electrics. The White steamer people will have an agency of its own. Dealers feel that so encouraging was the business done this year that the trade in 1907 should be increased proportionately to look for a big season.

**Shaw Adds Wayne**—The Walden W. Shaw Co., 1532 Michigan avenue, which represents the Berliet, has added to its line by taking over the Wayne agency, which was formerly handled by the Cornish-Friedberg company.

**Pope Garage Divided**—The big Pope garage in New York has been divided into two salesrooms. One is occupied by A. G. Southworth, the Pope agent, and the other by the Auto Supply Co., one of the largest accessories dealers in town.

**Henshaw Incorporates**—C. S. Henshaw, of Boston, the Haynes New England representative, has incorporated his business into the Henshaw Motor Car Co., with the intention of increasing the volume of business during the coming year.

**Mistake in Transposition**—In the page advertisement of the Waltham Motor Car Company in the last issue of Motor Age the price of the service car was given at $400 [illegible] is well known, the price should have been $450, the error being made in a transposition of illustrations.

**Autocar Progress**—The Autocar Co., of Ardmore, Pa., has arranged with Furman & Furman, its New York representatives, to open a big garage at Broadway and Eightieth street. A long lease of the building has been taken. The salesroom will occupy 27 feet on Broadway and 100 feet on Eighteth street, and the entire basement, which is 50 by 100, will be devoted to a repair department. Furman & Furman will move to the new building about December 15 from their present temporary headquarters at 50 West Forty-third street.

**New Garage at Allentown**—The Berwin Auto Co., of Allentown, Pa., is about ready to move into its new garage, at 128-132 North Eighth street. The new place is a four-story structure 50 by 110 feet, fireproof throughout. A large show room is on the one side and tourists' waiting room on the other side of the 10-foot driveway in the front part of the first floor. The garage is on the first floor, as well as the repair shop. The Berwin people are handling the Peerless, Elmore and Pope lines. The place is appointed as an official garage of the American Motor League.

**Testing Compound Engines**—A series of tests is now being conducted at the factory of the E. H. V. Co., at Middletown, Conn., where Professor J. E. Denton, of the Stevens institute, has been testing Compound engines from a scientific standpoint to ascertain the comparative economy of the high and low-pressure principle as compared with the ordinary four-cycle gasoline engine. The tests are made not only from the viewpoint of the actual power produced, but also to determine the matter of the thermal efficiency of the engine built by the company.

## RECENT INCORPORATIONS

**Freeport, Ill.**—Shoemaker Automobile Co.; capital stock, $1,000; to manufacture and deal in motor cars. Incorporators: Edward L. Evans, Charles Mundhenk and C. B. Courtney.

**Connersville, Ind.**—Ray Motor Co.; capital stock, $100,000. Incorporators: J. J. Maloney, Bowen Ray, W. S. Calder, Louis D. McFall and J. F. Geary.

**Elkhart, Ind.**—Elkhart Garage Co.; capital stock, $10,000; to deal in and store motor cars. Incorporators: Charles G. Conn, William J. Gropert and Mary E. Landon.

**St. Louis, Mo.**—Paper Automobile Co.; capital stock, $6,000. Incorporators: Clarence F. Paper, Charles Paper and Frank Hobein.

**Davenport, Ia.**—Davenport Motor Car Co.; capital stock, $10,000; to manufacture gasoline engines, motors, etc.

**New York**—Arlon Garage; capital stock, $20,000; to deal in and store motor cars. Incorporators: William Huebner, Robert Huebner and Walter H. Saltseider.

**Boston**—Matheson Co. of Boston; capital stock, $25,000; to handle motor cars. Incorporators: Freeman N. Young, Robert A. Faye and Francis D. Bennett.

**Boston**—Henshaw Motor Car Co.; capital stock, $10,000; to deal in motor cars. Incorporators: Charles S. Henshaw, William T. McQuillen and Richard D. Henshaw.

**Marion, Ind.**—Murillo Motor Car Co.; capital stock, $25,000; to deal in motor cars. Incorporators: Wilbur M. Myers, Lembert W. Coppock and Harry F. Reynolds.

# Just Between Ourselves

EVEN after the readers of Motor Age have gone through and thoroughly examined this issue, they will not be able to appreciate the amount of labor involved in producing such a number. It must be borne in mind that a paper of the character of Motor Age cannot be in a position to throw on extra help in order to meet such demands as are occasioned by the production of an immense issue. Those who have the task of producing Motor Age must be experienced not only in newspaper work, but in all branches of the motor car industry as well and, therefore, become what is known as technical men, although not all of them necessarily past graduate engineers.

Every resource that a publication of the character of Motor Age has must be called into action, and even then there are many sleepless nights for all engaged in the work. The writers, the artists, the engravers and the printers are compelled to work without regard to their own personal comfort. They must labor on and on, keeping up to a schedule that has been prepared in order to produce the paper on time. In addition to all this work the readers should bear in mind that each week prior to such a number the regular edition must appear. It would require several pages the size of Motor Age to begin to tell how the work is done in so short a space of time, but one word will tell it to a certain extent—that word is "system."

The expense involved in the production of such a number as this is so great that a couple such issues are really well worth the price of an annual subscription. In the middle of January Motor Age will produce another similar edition, when the motor car show of the Association of Licensed Automobile Manufacturers is held in Madison Square garden, and still again there will be another monster in the early part of February in connection with the Chicago show. Following this will be local shows in Detroit, Buffalo, Cleveland, Boston, Philadelphia, Washington and other cities of their class, the stories of which will be told in such a manner as to give the reader a complete knowledge of what is shown and what is taking place.

Look back over the past year and try to recall if any other motor publication has equalled Motor Age in the production of magnificent issues on special occasions and in substantial issues each and every week.

★ ★ ★

The interest taken by motor car owners throughout the country in our offer to include a $2,000 accident insurance policy paid up and non-assessable for 1 year, with every $2 subscription to MOTOR AGE, has resulted in such an increase in mail matter addressed to us as to necessitate a special man on our pay rolls whose principal duty is to deliver to us the most of our mail. Thousands of letters of inquiry for further details have been received during the past 10 days and the paid circulation of MOTOR AGE is on the increase proportionately.

Here's a letter from one of our many pleased patrons expressing sentiments which must mean much to every advertiser in the trade. Read it. Think what it means for a man, or concern, who mails us a check for advertising every month, always discounting his bills, to give utterance to these words. Then if you want results, act.

Read the letter:

DETROIT, MICH., Nov. 20, 1906.—MOTOR AGE, Chicago, Ill.—In connection with our advertising campaign in MOTOR AGE, it gives us pleasure to state that we consider it the very best investment we ever made.

Through your paper we have sold large quantities of our goods in all quarters of the United States, and a great number likewise in foreign countries.

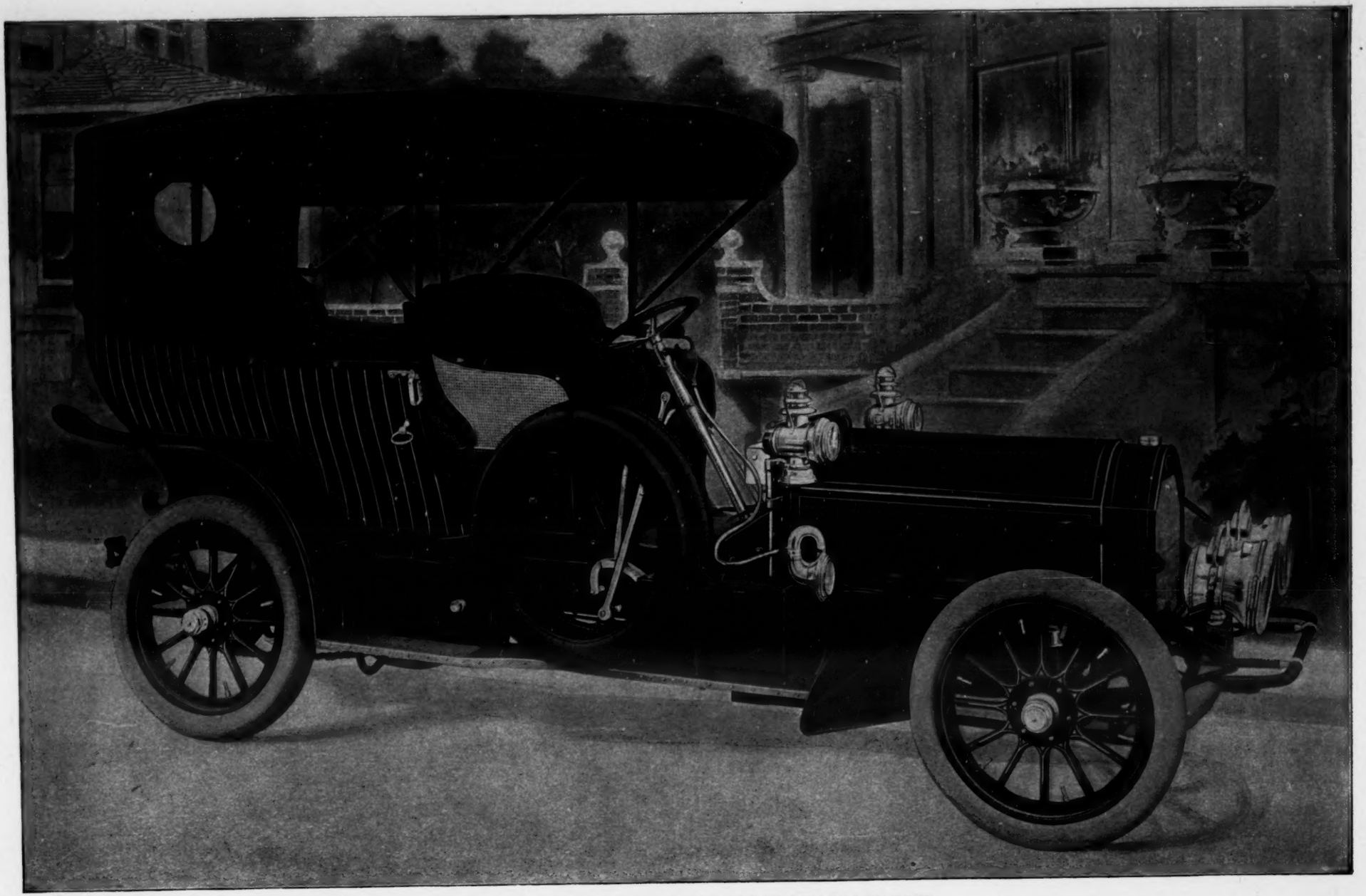
The claim that you make, that MOTOR AGE reaches thousands of automobile owners every week has been proved to our entire satisfaction, and so far as a continuation with our advertising with you is concerned, we can only say that you may count us with you for life.—ROBERT INSTRUMENT CO.

★ ★ ★

Frank M. Nason, of Leoti, Kas., writes as follows: "I hand you herewith my application for $2,000 worth of accident insurance, as per your terms, and in regard to same I will say I can heartily endorse your plan and I think it will meet with general favor with every motorist, and none can afford to miss the opportunity. Aside from the fact that one gets such an excellent magazine, this insurance is at a price that everyone can afford, no matter how much life or accident insurance he may carry beside it. I can certainly commend it and your magazine to all."

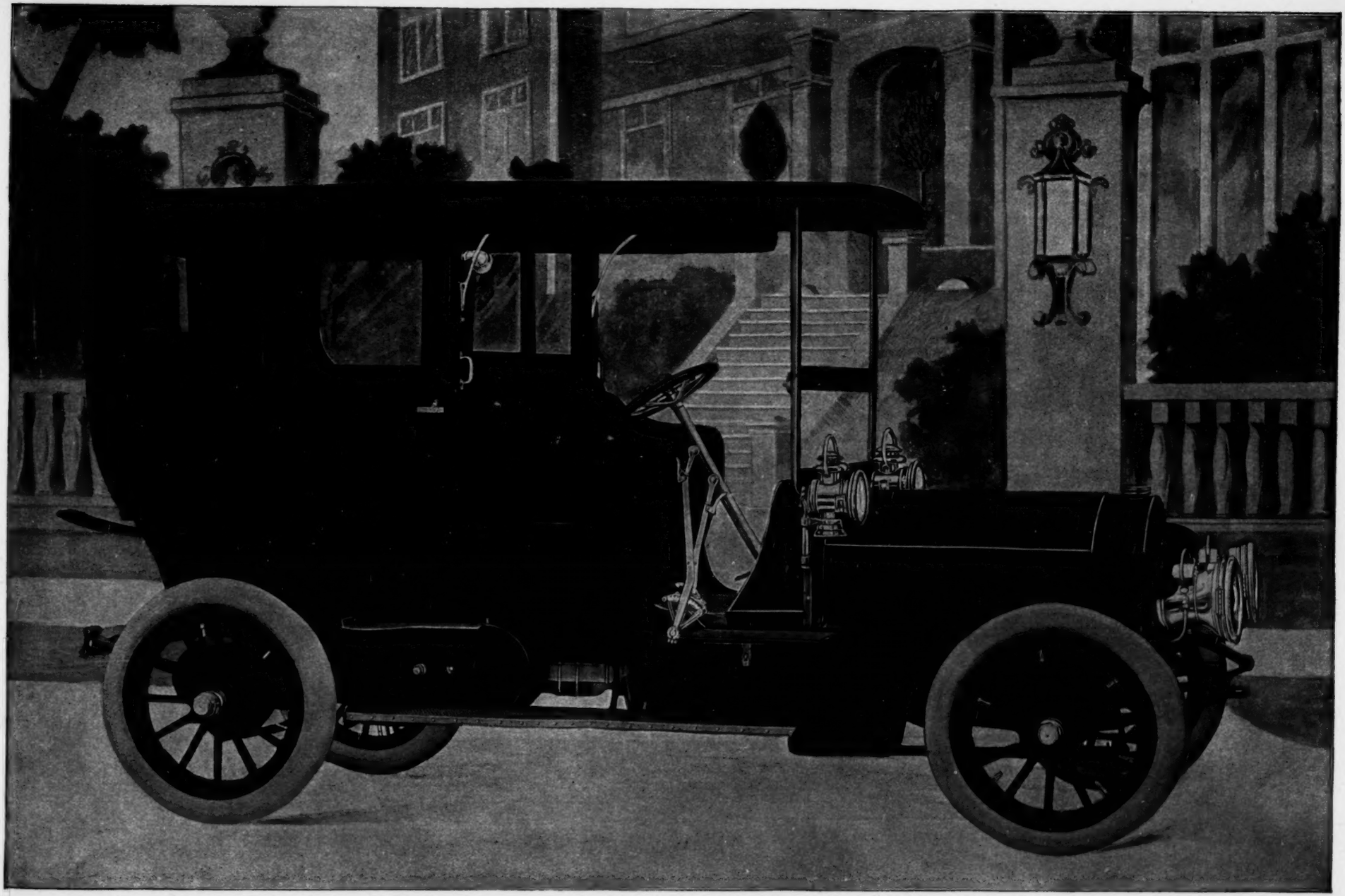
F. W. Meister, of Mt. Pulaski, Ill., writes: "Your favor of November 21, enclosing accident insurance policy, received, and as requested I return herein application blanks filled out. I think the insurance proposition very good and one that all motorists should take advantage of."

William F. Luick, of Milwaukee, Wis., writes: "Yours of November 22 received. The subscription to Motor Age and insurance is to be a Christmas present, and a good one it is, too. I think your idea of insurance is splendid, and it ought to bring a good many subscribers, although I consider your paper head and shoulders above any other of its kind, and fully worth the price, without insurance."



50 H. P. Touring Car
PRICE, $4,700.00

FINE CARS FOR THOSE WHO WANT THE BEST
APPERSON BROS. AUTO CO., KOKOMO, IND.
BRANCHES: NEW YORK BOSTON PHILADELPHIA CHICAGO

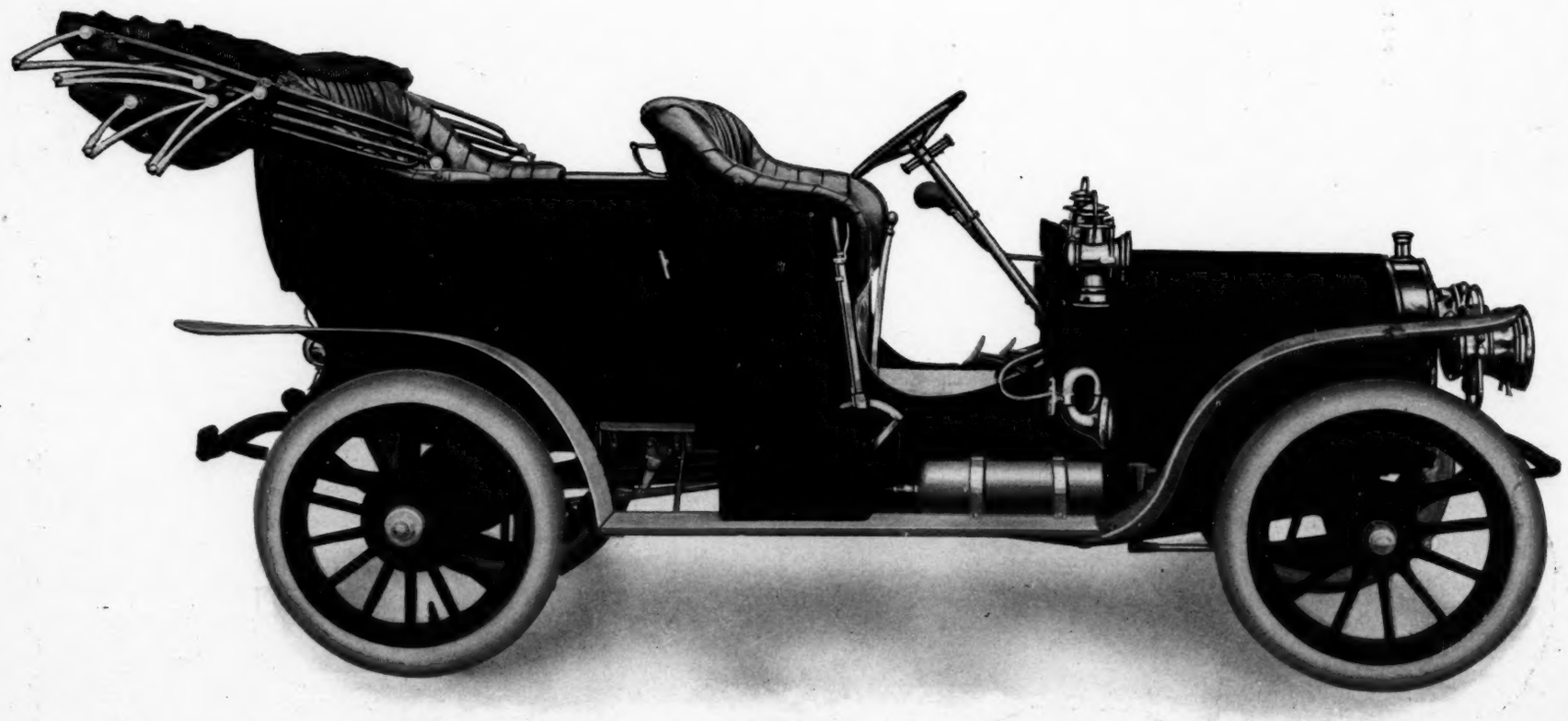


40 H. P. Limousine
PRICE, $5,600.00

SPECIAL CARS, THE HIGHEST QUALITY MADE

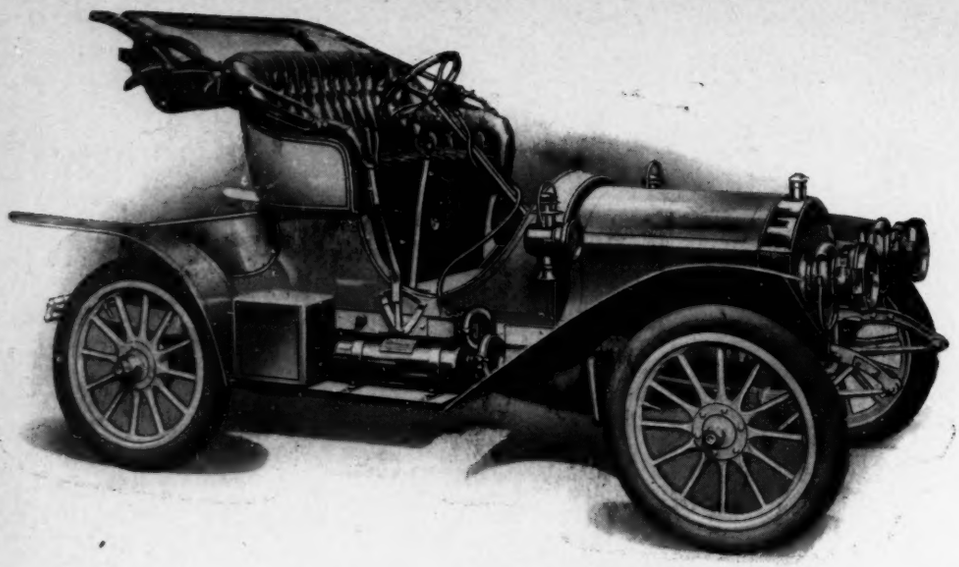
APPERSON BROS. AUTO CO., KOKOMO, IND.

WRITE US OR ANY OF OUR BRANCHES. MEMBERS A. L. A. M.



MODEL-F. PRICE, $2,500 COMPLETE, WITHOUT TOP

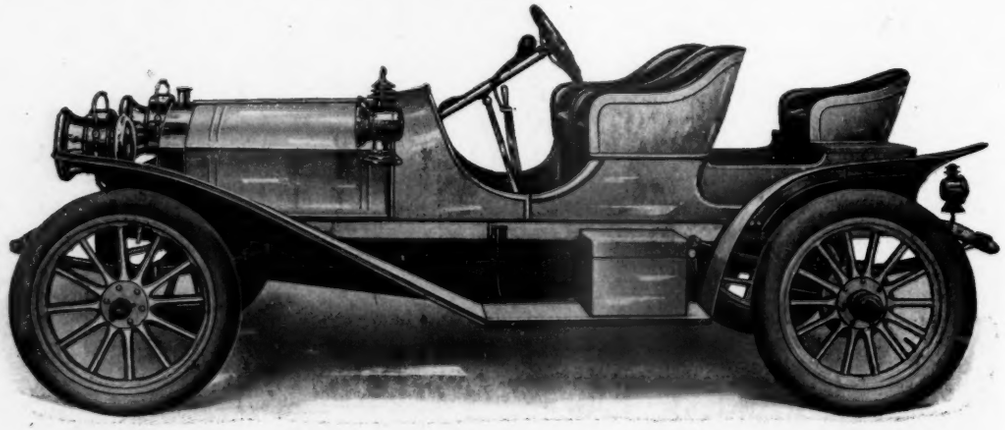
# Stoddard-Dayton



MODEL-H. RUNABOUT
PRICE, $1,750
COMPLETE, WITH TOP

MODEL-F. LIMOUSINE. PRICE $3,500 COMPLETE

MODEL-K. RUNABOUT
PRICE, $2,500
COMPLETE, WITHOUT TOP



# Stoddard-Dayton

## The Dayton Motor Car Company, Dayton, Ohio